American Machinist

NOVEMBER 4, 1936

SOCIAL SECURITY

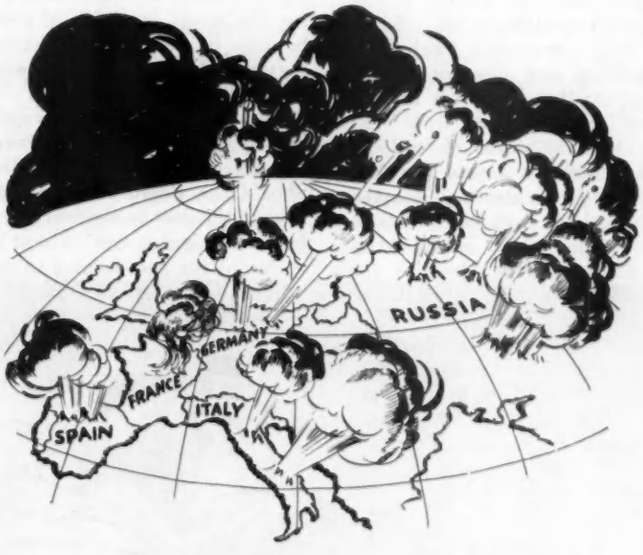
A Non-Political Question

K. H. CONDIT
Editor

WITH ONE one notable exception, the revolutions that have changed the face of Europe have occurred in countries that have steadfastly refused to enact social legislation. The one exception, of course, is Germany, where social legislation has been in effect for many years. In this case the revolution grew out of the desperation of a defeated and humiliated people. Maybe there were other causes for revolt, but with these examples in front of us it would take a hardy man indeed to insist that social security in the United States is a partisan political question.

As a people we are going to do a better job with social security than we have done so far, and regardless of the outcome of the November 3rd election, which is two weeks ahead as this is written, the Social Security Act will stay on the statute books. Too many votes are involved for any party or Congressional group to dream of attempting to repeal it. It will be amended, of course—it must be amended if it is to come anywhere near meeting the high expectations of its prospective beneficiaries. Men who know their way about in political circles predict that it will be amended by every Congress for the next ten years. It is unworkable in some particulars as it stands, and probably unconstitutional in certain of its parts. These faults must be remedied.

Such being the case, the vital need for informed and intelligent men in the ranks of both political parties and in business is obvious. We must have Congressmen in both parties who are making the social security problem their major interest, men of the type whose words are listened to with respect by their less well informed colleagues in the legislative halls. They must be in both parties so that no matter which party is in power the necessary amendments to the original Social Security Act will be handled by men who know what they are doing. At the same time there must be an equally well informed opposition so that controversial points can be adequately debated before final action.



Most of the European revolutions have occurred in countries without social legislation

There is an equal need for informed men in the ranks of business and industry. Business and industry after all are being asked to foot the bill for social security. When I say this I am using business and industry in the sense that they include the mil-

lions of wage earners whose pay checks are going to be affected by social security taxes.

Every trade association should have a Social Security Committee made up of the most intelligent and broad-minded men within the organization; men who are willing to give lavishly of their time and efforts in the interest of their respective industries. They should be the type of men who will not act or make recommendations until they have secured the best attainable professional advice and have themselves studied every phase of the social security problem. Nothing short of this will suffice.

If our trade associations will appoint committees made up of men of this sort, and will give them the opportunity to make the studies of social security that should be made, what they say before Congressional committees will be listened to with far more attention than has been accorded most of the expressions by business men during the last four years.

Winant Quits

It is to be regretted that so astute a political trend observer as ex-Governor Winant of New Hampshire has been permitted to resign as the Republican member of the Social Security Board. He was well aware of the danger of permitting the Social Security Act to become a football of partisan politics, and it seems reasonable to suppose that his rather dramatic gesture of resigning from the Board so that he could defend its action was taken to arouse the Republican board of strategy to the danger of going any farther than Governor Landon went in his Minneapolis speech. Those close to the social security question attribute to Governor Winant's acumen the decision to have the necessary census of employees taken by the Post Office Department rather than by a newly organized bureaucracy of Social Security Board employees.

One of the soundest objections made to the Social Security Act has been to the setting up of another hungry bureaucracy to live off the taxpayers. No matter how such an organization is set up a certain proportion of it acquires a vested interest in its job and is almost impossible to dislodge after the job is done. The Post Office organization has been in existence for a long time; it did a good job with the routine of handling the bonus bonds and there is no reason to believe that it will not do an equally good job in taking the census of those affected by the Social Security law.

It is true, of course, that such an organization will not do as thorough a job of census taking as would a specially picked crew under the direct supervision of the Social Security Board. It is certainly preferable, however, to have an 80 or 90 per cent job done in this way, rather than to reach for the additional 10 or 20 per cent at the cost of adding to our already bloated bureaucracy. According to the announcement of the Social Security Board the enumeration of workers under the old age benefit provision of the Act will begin about the middle of November. It will not be as nearly complete a job as would have been done had the enumeration started earlier, and been done by Board employees, but it will be done well enough for the needs of the case and it will be done by employees under the Civil Service. If any question arises, the Post Office people will ask the company or individual concerned to fill in the blank and then forward it to Washington for decision by the Board. Should the Board feel that investigation of the case is necessary, inspectors from Washington can be sent out.

One of the encouraging things about the procedure of the Social Security Board has been the care taken to secure the best possible advice on methods and routine in securing and keeping records of those who come under the provisions of the act. Experts on such matters have been in consultation with the Board and its division heads for months and have evolved a mechanized system of record keeping that reduces everything possible to a basis of routine rather than one of judgment. Several European countries have had years of experience in this direction and the members of the Board have not hesitated to draw fully on this experience and to apply such procedure as would fit the needs of the case in this country. Governor Winant has said on several occasions that the task would have been impossible without suitable mechanization of the record taking and keeping facilities.

Another hungry bureaucracy to live off the taxpayer

An Unwieldy Reserve

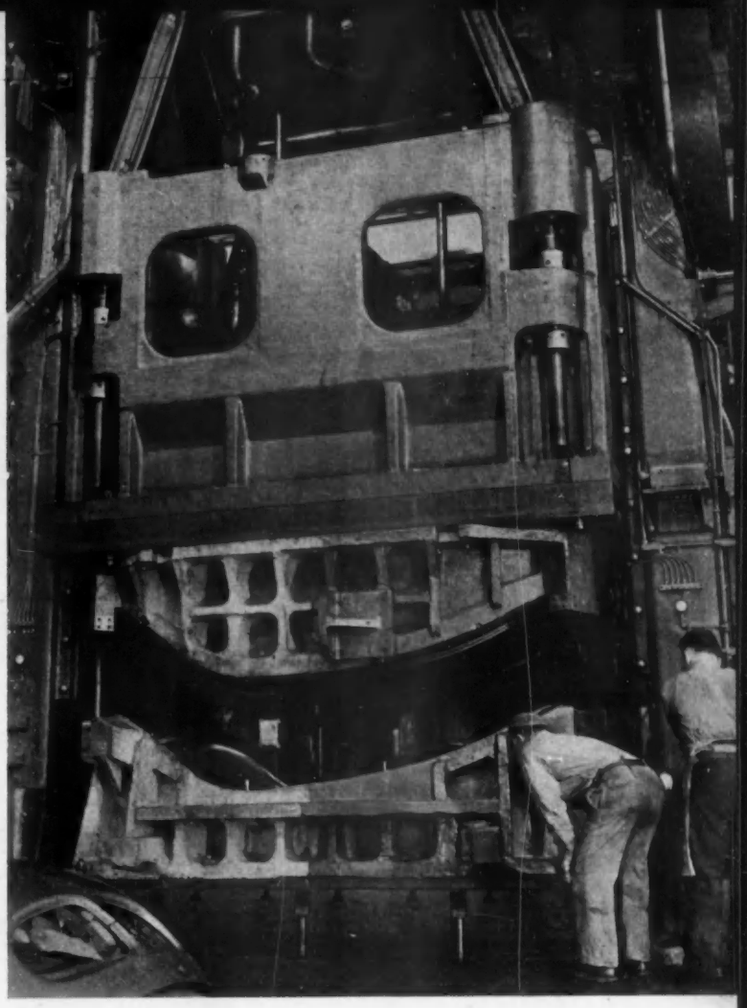
The major fault of the Social Security Act itself is the provision for an entirely unwieldy reserve fund. This fund is estimated to reach the astronomical figure of nearly $47,000,000,000 by 1980. A fund of some sort is necessary, of course, to tide over the social security payments during emergencies that may arise when Congress is not in session, but a fund of $5,000,000,000 would be ample for this purpose and such a sum would be far more nearly in keeping with the debt structure of the country than the one provided for in the Act as it stands. To be fair to the committee of experts that outlined the original bill, it should be said that this provision for a huge reserve is a frill added by members of the party in power who were not too well acquainted with such matters. It is impossible to exaggerate the danger inherent in the establishment of any such fund as the one authorized by the Act, and the Act should be amended in the next Congress to correct this major fault. Fortunately, the amendment can be made by changing one or two sentences in the bill. Experience abroad with social security legislation has shown that anything more than moderate reserves is totally unnecessary. We should at least be willing to profit by the experience of those who have experimented in this field.

In conclusion let me say again that social security is a question of paramount importance in this country and that the only way to handle it intelligently is to train up a group of informed citizens both among the politicians and among the leaders of industry and business. They cannot begin their work of revising the Social Security Act too soon.

DOWN THE LINES WITH 1937 CARS

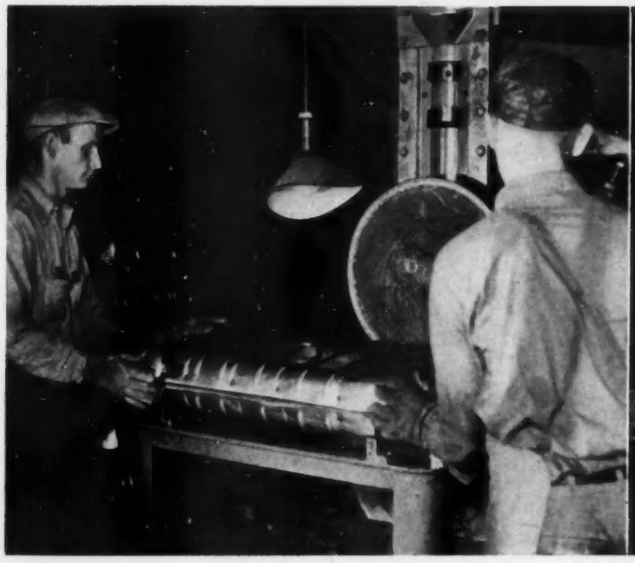
Show time in New York means Go time in motordom; modern equipment helps manufacturers meet new model demands

CAR MANUFACTURERS are entering the 1937 season confident that they will build and sell close to five million units, not far from the all-time record. In anticipation of a good year, they have expanded their productive capacity. In connection with improvements in their products, they have retooled their plants. They have purchased new equipment which lowers manufacturing costs. They have devised new ways of doing things. Altogether, they have poured tens of millions into new dies, machinery and added plants. Chevrolet alone has made a capital outlay of $26,000,000. On this and following pages *American Machinist* presents the first story, in pictures, of what is new in automotive production for the coming year.

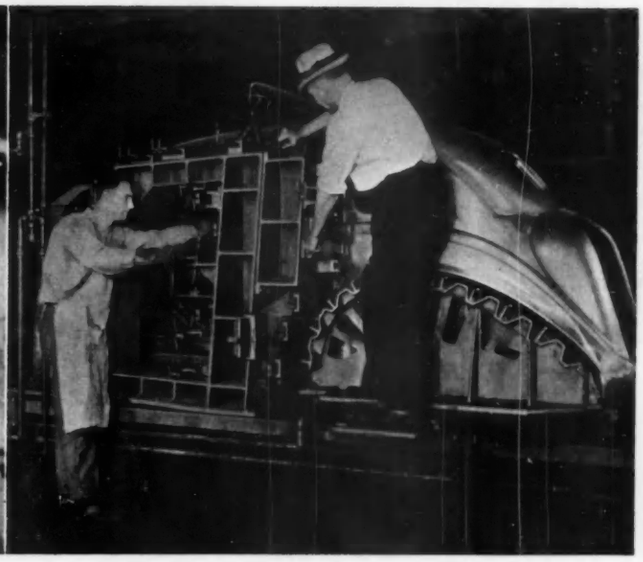


● *HUDSON uses five sets of dies for its steel tops; although turned out in four weeks of day and night work their building required 30,000 man-hours of labor*

● *PONTIAC gasoline tanks are seam welded on a table which revolves to reach all sides*



● *DODGE checks all-steel bodies in inspection rigs manned by crews of expert examiners*



DOWN the LINES WITH 1937 CARS

▼

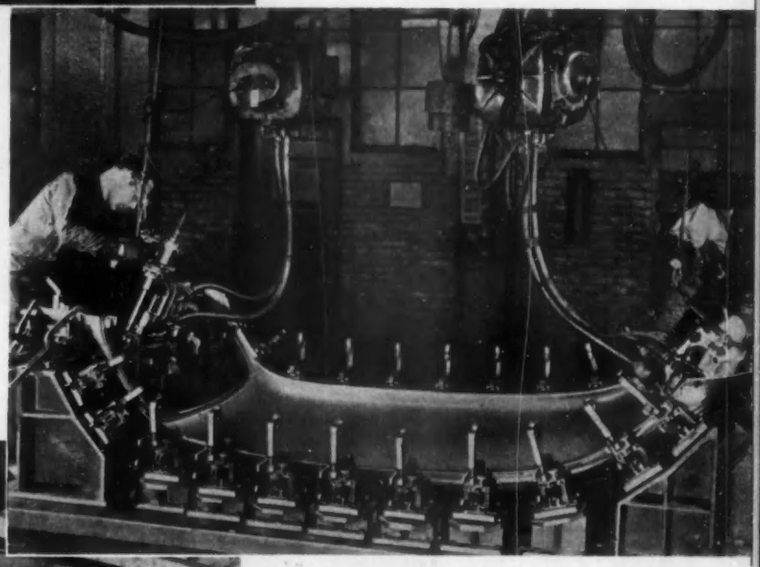
● *BUICK'S front fenders (right) are stamped from a one-piece blank 92½ in. long stretched to 102½ in. or 11 per cent; fifteen press operations and twelve finishing operations are required*

● *DE SOTO workmen (below) seal a rear spring in its metal jacket after covering it with lubricated white duck; air hammers lock the metal cover permanently in place*

● *PLYMOUTH (bottom)—not much rear fender left, thanks to wider bodies, but they still have to be rubbed down*

● *PONTIAC front fenders (left) are now stamped in one piece except for one small part which is welded at the rear*

● *DODGE employs an elaborate jig (below) to weld drip moldings to steel body roofs*



● *CHRYSLER Royal cylinder blocks (below) undergo 145 operations in this one machine with its 10 electric motors*

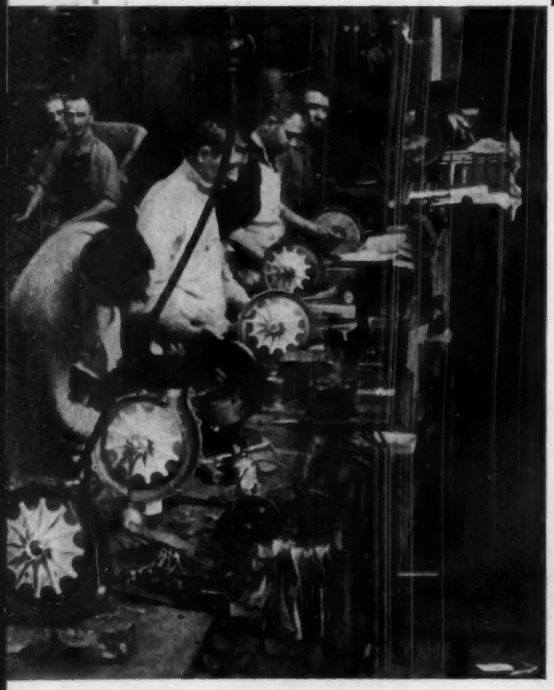
● *PACKARD mechanics (lower right) call this Greenlee seven-way piston sawing and drilling unit the Rube Goldberg machine*

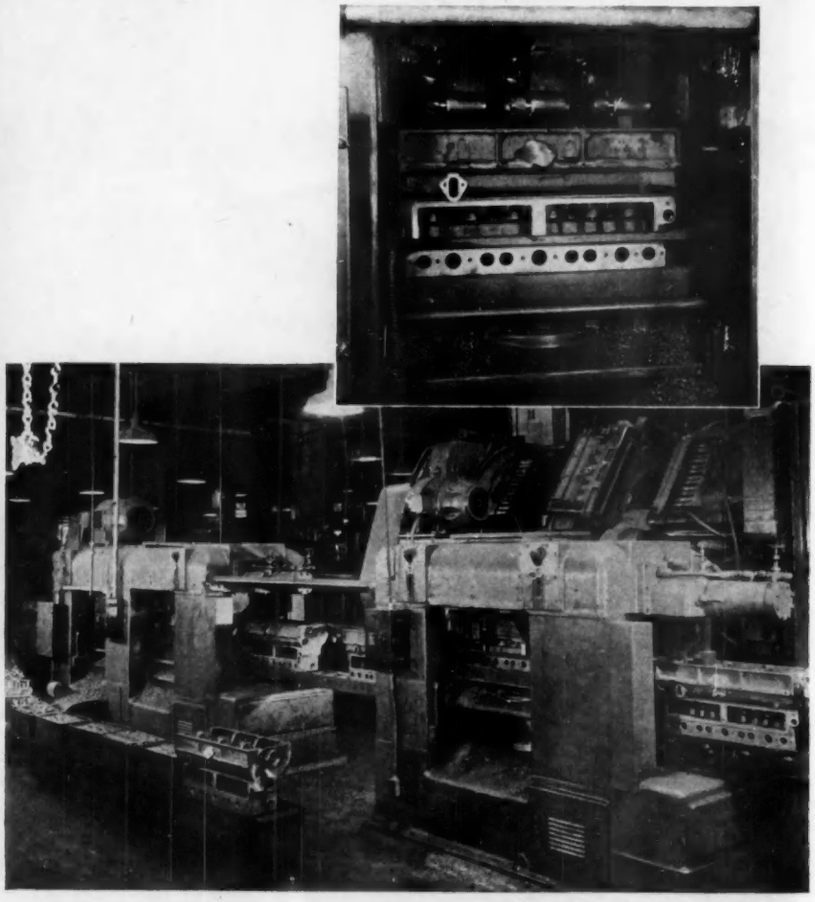
DOWN the LINES WITH 1937 CARS

● *A. C. SPARK PLUG (right) assembles radio control units to meet the growing demand for radio equipment in automobiles*

● *GRAHAM-PAIGE'S supercharger assembly line (below) provides units that will go on approximately 50 per cent of this company's 1937 cars*

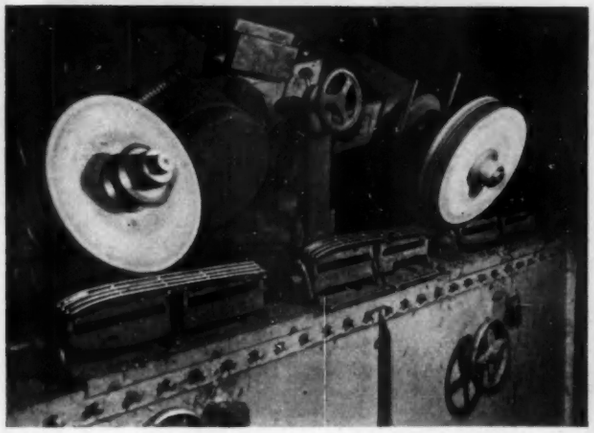
● *PACKARD (right below) has an Ingersoll set-up for boring crank and cam bearings in the cylinder block; three stations have four heads each with two spindles for rough, semi-finish and finish boring respectively*

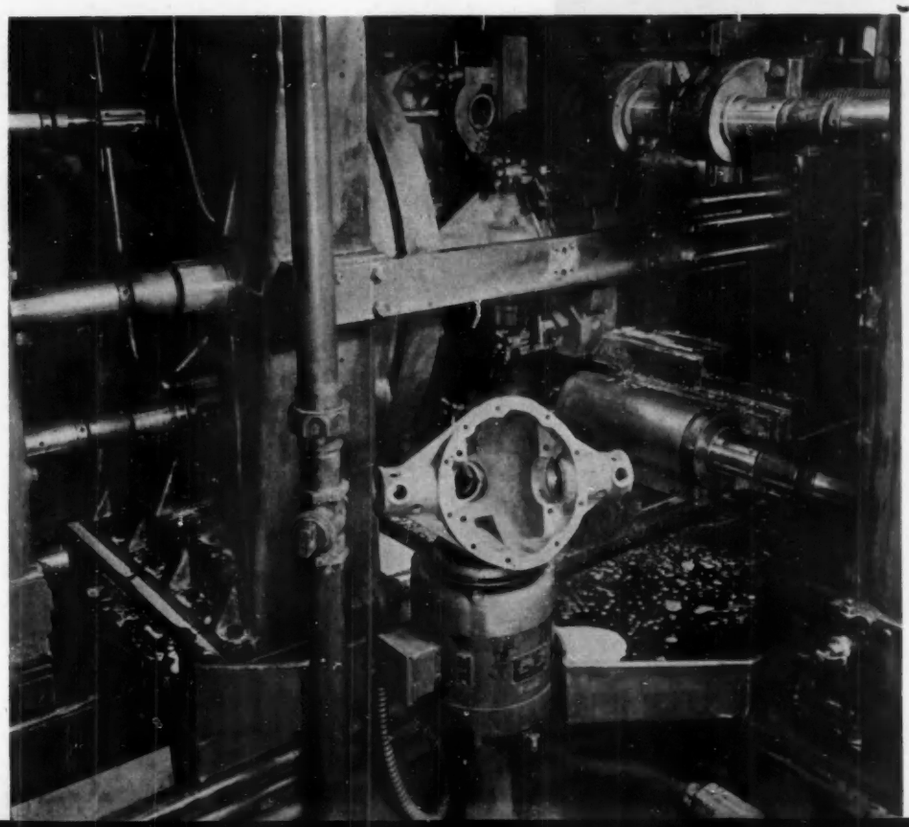




● *CHEVROLET knee action housing being reamed under an upright drill at the Detroit plant*

● *STUDEBAKER crankshafts are balanced and corrected on Olsen equipment*



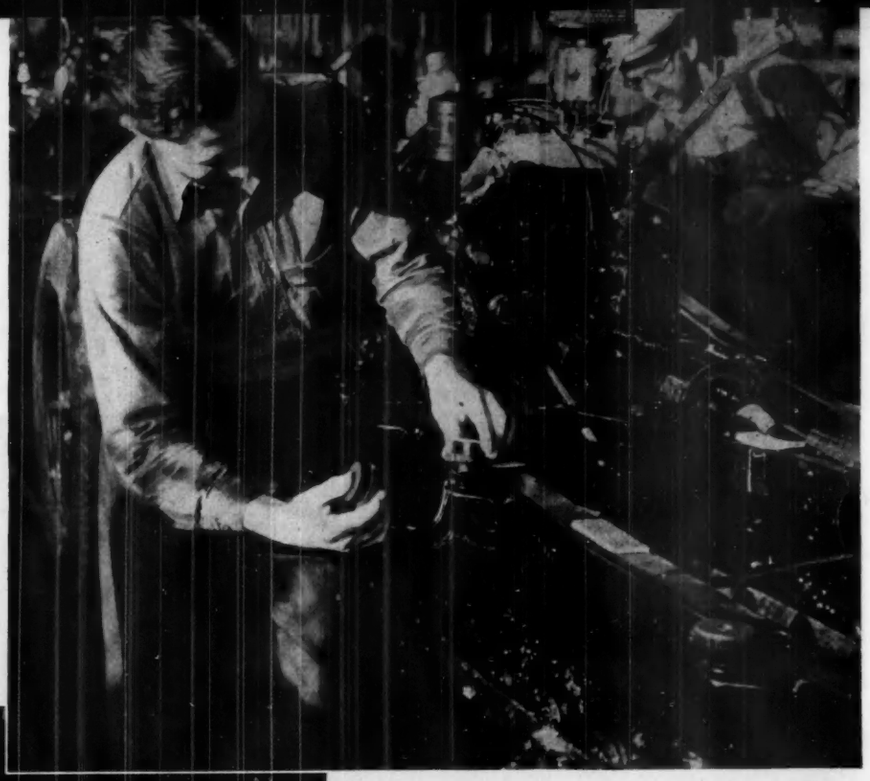


● *PONTIAC (left above) continues the Silver Streak as a trademark and buffs the pieces like this*

● *NASH differential carriers (left) are subjected to six simultaneous boring operations in a three-way machine*

DOWN the LINES WITH 1937 CARS

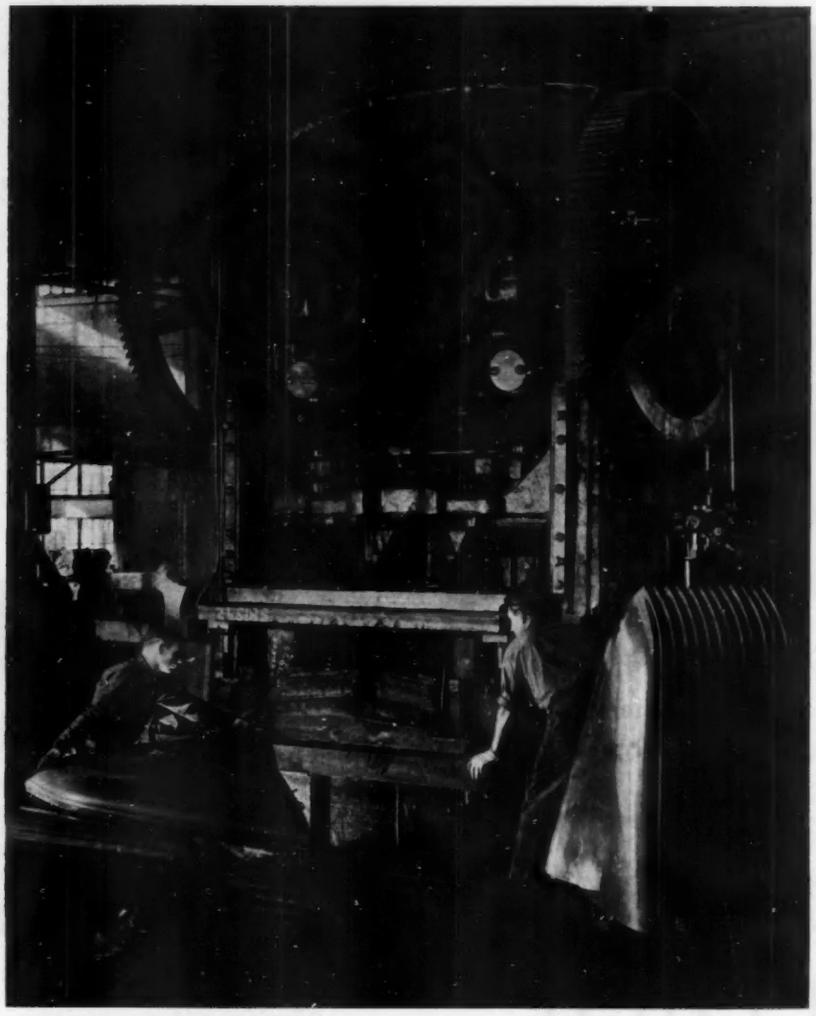
▼



● *PLYMOUTH body mounting involves the use of chassis outriggers equipped with rubber spools to keep road noises from reaching the body*

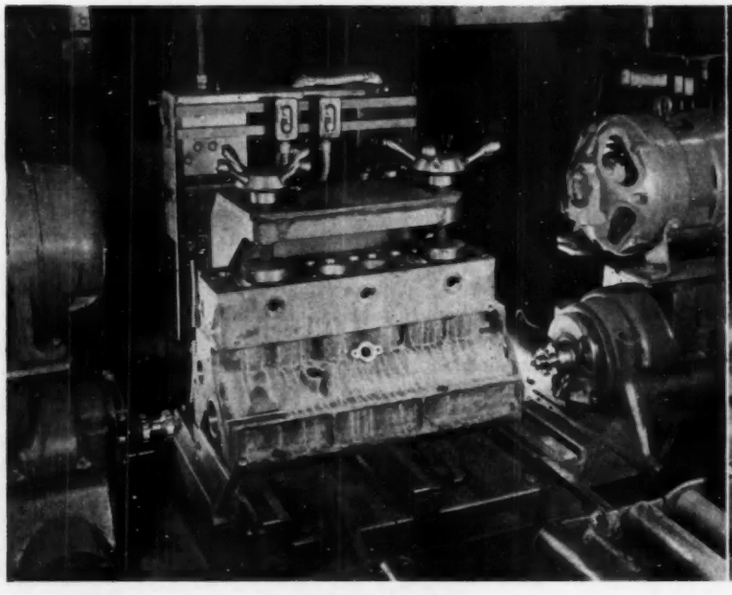
● *PONTIAC uses a special machine to turn flat strip into the Silver Streak that will adorn its new models*

● *GRAHAM-PAIGE gives motor blocks their final tests on valve tappets, carburetor, ignition and clutch*

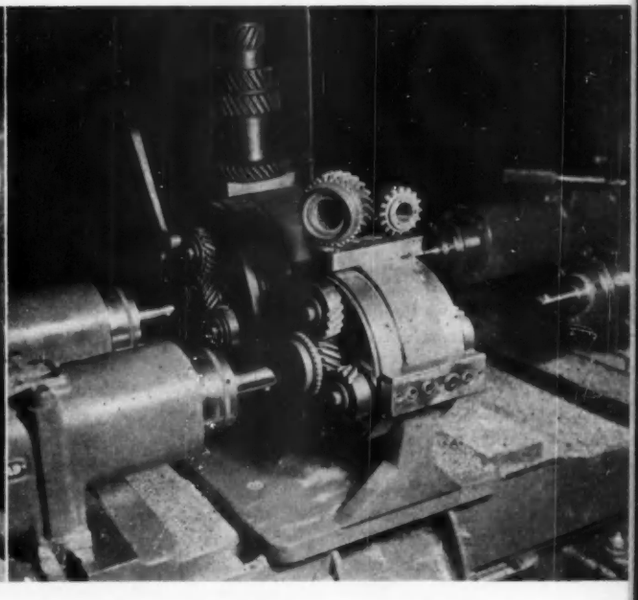


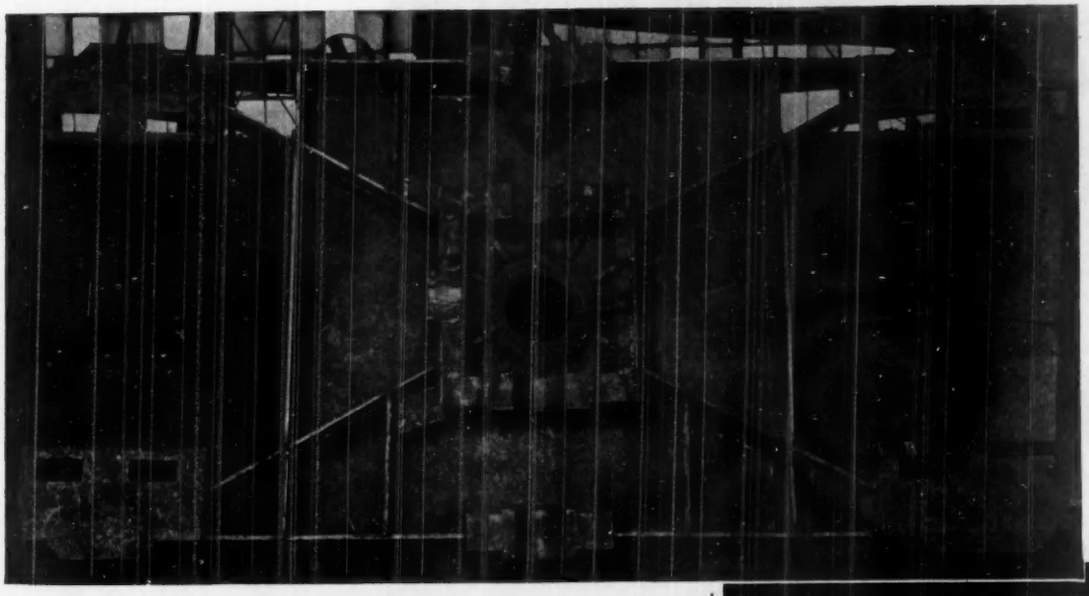
● *STUDEBAKER'S alligator-type hoods are flanged in a Hamilton press*

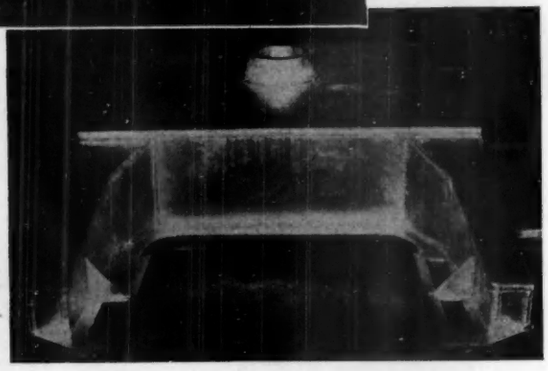
● *PACKARD machines main bearings in its new six block on a Newton planetary miller using two cutters at one end and one at the other*



● *NASH gears, four at a time, located by the pitch line, are precision bored in this four-spindle Heald*







Only 90 man-hours were required to arc weld this frame which formerly required one month for casting

CRANE FRAME ARC WELDED

A. H. DAVIS
Lincoln Electric Company

ONE important factor in the adoption of mild steel in machinery building has been steady development in the shielded-arc process of electric welding. Because of the high quality welds which it provides, and as a result of the inherent simplicity of the process itself, machinery structures of high quality are being fabricated at great savings.

A typical example of simplified arc-welded construction is the tractor frame for a locomotive crane. This steel frame replaces one of cast iron which had failed in service. It is 9 ft. 10⅞ in. long, 5 ft. 8 in. wide and 1 ft. 4¼ in. high overall. It was built by The Lakeside Welding Company for a large crane manufacturer, by the shielded arc process of welding with equipment supplied by The Lincoln Electric Company.

Assembly of the 90-odd parts began with laying out the design on the 1⅛ in. base plate. This plate, which serves as the rotating table of the crane, is 5 ft. square. With positions clearly marked, the various parts were accurately placed without use of jigs, tack welded, checked for alignment and squared up with a machinist's square, then finish-welded, followed by stress relieving.

First to be welded were the two side members cut from ⅝-in. plate. Horizontal members, of ½-in. plate, were then welded to the side members, following which the assembly was tied together by four diagonals welded integral with each horizontal member and the base plate.

The four bearing caps are cut from bar stock and welded in place. The two outer caps are 6-in., the two inner 4½-in. The crane axle supports, welded to the frame at the four corners, are 1⅛-in. plates. All welded joints are scarfed, and all welds are 100 per cent penetration. Practically all the welding was done with ¼-in. electrodes.

The gear case in the center of the frame was fabricated as a separate unit and welded in place. The gear hub, which tapers in thickness from 3 in. on the bottom to 2 in. at the top, is a formed piece of bar stock. It is held in place by a webbing composed of twelve lengths of ¾-in. plate welded to the hub and to the gear case.

Through use of welded construction, weight is reduced from 6400 lb. to 4160 lb. Cost of materials was approximately $30 less than with casting, exclusive of patterns.

STUDY *SPEEDS* MILLING

W. W. GUMPRICH
Manufacturing Engineer, International Business Machines Corporation

Careful analysis plus a willingness to experiment ran the feed on a Bakelite part from 2⅝ to 100 in. per min., increased output of an intricate cast iron piece by 350 per cent for one milling operation

INCREASING the milling feed on a business machine part made of Bakelite from 2⅝ to 100 in. per min. sounds like something of an achievement. Yet it is only an example of what is being done as part of the day's work at the Endicott plant of International Business Machines Corporation. It shows what can be accomplished through the system of using trained process engineers to analyze and improve conventional practice.

This system was outlined in a previous article (*AM*—Vol. 79, page 845). Two actual cases are given, in considerable detail, to show just how the system works. These cases are typical of the continuing effort to reach higher standards of performance that was mentioned in the earlier article. They will show that the progress is a matter of evolution, step by step, rather than a rash jump from moderation to extremes.

Our milling machine department provides a good background for this demonstration. Although we have added many new pieces of equipment since the beginning of the work to be described, the department was previously well provided with modern tools and had a creditable efficiency record.

To understand clearly why some of these moves were taken step by step instead of in one jump, it is necessary to understand the situation surrounding our production program. In the neighborhood of 45,000 different parts are being manufactured. A great many of these, in the course of each year, are either completely eliminated or replaced by new parts. Many more undergo important changes. Any expenditures for tooling, in consequence, have to pay for themselves in a very short time. Therefore, it becomes necessary first to make all possible savings and economies with the existing tools. Additional expenditures for jigs and fixtures, or new machine tool equipment, must be justified by the assurance that the savings made therefrom will absorb the purchase price within one year.

Now, let us proceed with a typical case:

Plugboard Job, Part No. 135318

This particular part is Bakelite, with a usage of from 12,000 to 14,000 a year. The operation that I wish to discuss consists of milling 20 slots, approximately 5/32 in. wide x ⅛ in. deep, see Figs. 1 and 2. Bakelite is a very abrasive material, and considerable difficulty was experienced with the milling cutters. At the time when this job came under consideration for increased output, high-speed tungsten steel mills were used. In order to obtain what we considered a reasonable output per grind, speed and feed were relatively slow. As a matter of fact the feed rate was 2⅝ in. per min. We obtained 400 to 500 pieces per grind. Under the circumstances it is not surprising that we never caught up with production.

When the investigation started, our process engineer, Mr. Farbach, was not only after higher output per hour, but also after longer cutter life per grind. A gang of carbide cutters was purchased at a cost of approximately $850. On other Bakelite jobs, where we had used carbide cutters, we had experienced greater resistance to abrasion at higher surface speeds. Therefore, we stepped the surface speed up to about 600 ft. per min. and raised the feed at the same time to 5½ in. This was still a far from satisfactory output, but we did not dare to change this picture at first because our cutter life on the carbide gang was still unsatisfactory. We obtained only about 1200 pieces per grind.

At this stage, the process engineer resorted to analysis of the difficulties and the symptoms encountered. He reasoned correctly that the action of the Bakelite dust virtually lapped off the sharp edges of the milling cutter. If it were possible to reduce the number of contacts of each cutting edge with this Bakelite dust it must reduce the amount of lapping effect. The only way this could be accomplished was to increase the feed per minute. It was, therefore, gradually stepped up to 11 in. per min., watching the cutter action and finish at all times. At this stage, progress rested long enough to observe the results on the cutter. When it seemed to be evident that the expected reduction in lapping effect was actually a fact, in order to obtain the optimum output of the carbide gang, the feed was again increased first to 16, then to 22 and finally to 30 in. per min. Again a sufficiently large lot was run, after which the cutters were minutely examined. Not only was there no damage, but there

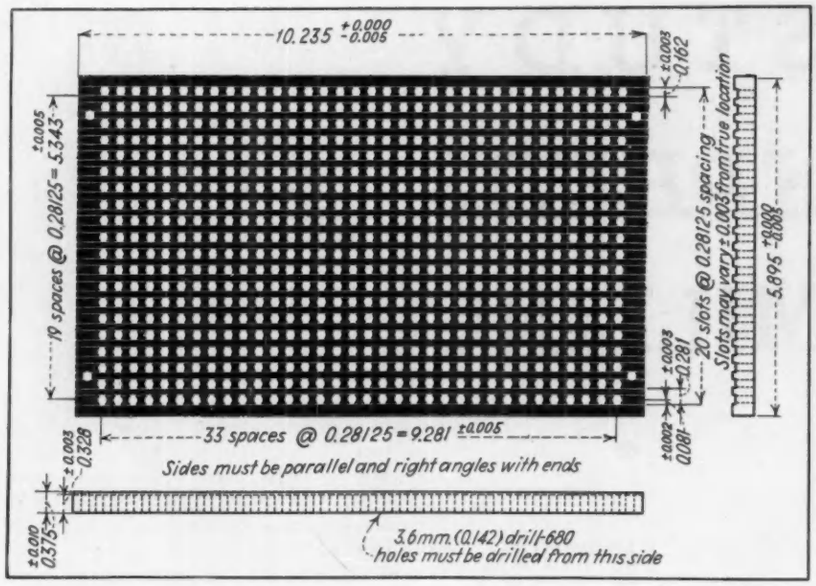

10.235 +0.000 -0.005
±0.003 0.162
±0.005
19 spaces @ 0.28125 = 5.343
20 slots @ 0.28125 spacing
Slots may vary ±0.003 from true location
5.895 +.0000 -.0080
±0.003 0.281
±0.005 1.800
33 spaces @ 0.28125 = 9.281 ±0.005
±0.003 0.328
Sides must be parallel and right angles with ends
±0.010 0.375
3.6mm (0.142) drill-680
holes must be drilled from this side

Fig. 1—Bakelite plug board, 20 slots to be milled

was much less wear on the edges. The finish of the slots was entirely satisfactory. Width of the slots was held within a tolerance of plus or minus 0.003 in.

The number of pieces per grind, of course, had by this time increased very materially. Also the work load on the cutters, on the machine and on the work itself seemed to be so light that it was decided to go still higher, but before all this was done, and knowing that the next step would be a considerable increase, logical analysis was again resorted to.

The next step, because of lack of any intermediate feeds, was the attempt to cut the piece by rapid traverse. Carbide tools are brittle because of lack of bond strength. Weak as this bond strength was known to be, however, we reasoned that the cohesion of the Bakelite particles would be less than the bond strength holding the carbide particles within the tip. When this conclusion was reached, we unhesitatingly went to the rapid power traverse and it worked as expected. Of course, the first piece was inspected for finish and tolerance. When it was found to be satisfactory a test run of several hundred pieces was made at the new rate of 100 in. per min. When inspection passed this test lot without any scrap, the new rate was then set as standard.

For a number of months, this new rate was in effect. The cutter life per grind had increased three to four times over the original figure.

Earlier in this article, it was mentioned that the cost of the carbide cutter gang was in the neighborhood of $850. That eventually it would have to be replaced was a foregone conclusion. About this time we had been carrying out considerable experimenting in rebuilding expensive saw gangs by chromium plating. These saw gangs have to cut slots from 0.068 to 0.108 in. in width. On a number of gangs as many as 80 of these saws are used. The depths of slots vary from ½ to ¾ in. in different pieces. A tolerance of plus or minus 0.001 in. in width and location of the slots, in respect to each other and to the end of the piece, has to be maintained.

High-speed steel saws are used, and under the tolerance condition have a very short life. This resulted in the extremely frequent replacement of the gangs at very high cost. Experience proved that chromium plating not only restored the original width of the saw but that it also gave a considerable increase in the life of these gangs. Aside from this, chromium plating almost completely eliminated the frequent replacements. As soon as the plating had worn sufficiently, the gangs were replated and successfully restored to tolerance. This plating is carried on in our own plating department, and considerable experimenting along these lines was carried out before the technique was fully developed to common routine.

Eventually the question came up of providing the necessary reserve gang for the aforementioned carbide cutters. Combining the experience in chromium plating with the experience we had gained on the Bakelite plugboards, it was decided to try chromium plating on existing high-speed steel gang cutters that had been discarded because of wear.

Fig. 2—Saw gang milling Bakelite at 100 in. per min.

The chromium plating built up the cutters to acceptable tolerances as expected. A test run was then made with this gang at 100 in. a min. It was found that the combination of the very hard chromium surface and high feed with its resulting minimum of cutter contact obtained extremely long wear. As a matter of fact, to our great surprise, the chromium plated cutters outlasted the carbide gangs. At the present writing, an unbroken record of 14,000 pieces between grinds is still going. It must be stated here that the production of 12,000 to 14,000 pieces, given earlier in this article, was the production figure existing at the time when the experiments were started. Since then our production has increased to more than twice this amount.

Fig. 4—Twin fixtures used for holding key punch under fast cut

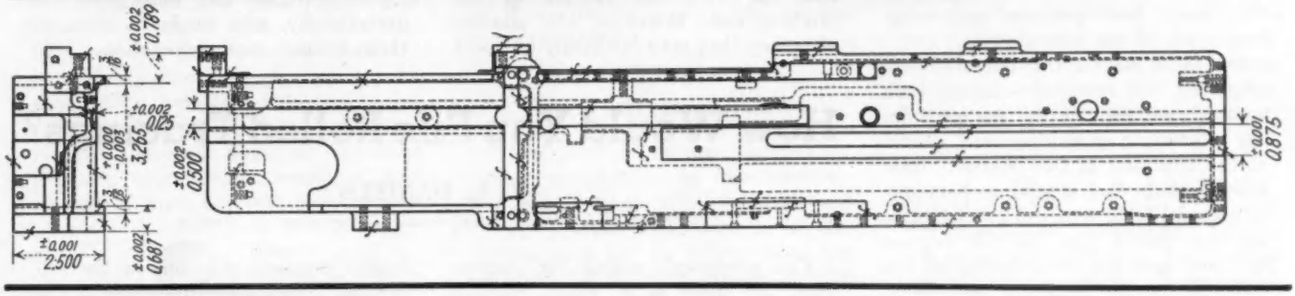


Fig. 3—Cast iron key punch base in which accurate slot for card track is milled at 19 in. per min.

This outlines clearly describes one phase of accomplishing manufacturing economies from every angle entering into the actual operation. These economies were accomplished in devious ways, to be sure, but logically nevertheless. That similar reasoning can be used on more conventional materials, such as cast iron, is demonstrated in the following case:

Part No. 8500, Duplicator Base

I shall now describe some of the operations on the duplicator base, part No. 8500. See Figs. 3 and 4.

To provide locating surfaces, the top and bottom are rough and finish ground on a Blanchard grinder. Milling is impractical because of the thin sections.

The second operation calls for duplex milling the sides. Originally high-speed shell mills were used. Existing engineering requirements of a very sharp corner on the ledges on one side, Fig. 3, prohibited a feed of more than 3 in. per min. Investigation of the function of the ledge permitted the elimination of the sharp corner, which resulted in greater life between grinds of the cutter used on this side. It will be noted that the surface on the opposite side is much larger. This is the front of the machine, and therefore calls for a high finish. The elimination of the sharp corner made possible the increase of the feed to 20 in. per min. and the use of a 5-in. inserted-tooth tungsten carbide face mill. The greater surface speed possible with the carbide mill produced the required high finish on the opposite side even at the 20-in. per min. feed. It is interesting to note that the increase in cutter pressure, as a result of the higher feed, made some minor corrections in the fixture essential for additional support in order to meet the tolerance demands.

The next operation consists of milling the 3.265-in. wide slot extending over the entire length of the piece. The surface of this cut must be smooth, first because it is the track for the tabulating card, but also for sightliness because this surface is in plain view at all times. The corners at each side where the face adjoins the walls must be absolutely sharp. The wall surface is a guide for the tabulating card as it travels through the machine. Since this machine is used to punch the holes into the tabulating card and since these holes must be duplicated from card to card with extreme accuracy in location, the limit of width for the entire length of the slot is held to plus 0 minus 0.003 in.

Originally all of the stock was removed at one cut, handling one piece at a time and using an extremely slow speed. All features entering into the milling operation, particularly the abrasive action of the cast iron dust and the heat of the cut, quickly dulled the sharp corners of the cutters. We were continuously asking for tougher and more durable material in the milling cutters to overcome this condition, which existed in spite of using an air stream against the cutter as a coolant. To obtain the necessary finish, accuracy, and a reasonable number of pieces per grind, we could not use a feed

greater than 2⅝ in. per min. It was necessary to maintain two cutter gangs, grinding and reconditioning one set while milling with the other. A maximum of 50 pieces per grind was the best that could be obtained.

In the process of improving the method, it was decided to rough out the center slot on a No. 3 vertical miller. The initial feed of 9 in. per min. was gradually stepped up until we found that job and machine stood up well at a 30-in. per min. feed rate. However, we were still not satisfied with the output. Another fixture was provided and the job transferred to a No. 4 vertical miller, where the table travel permitted the use of two fixtures, one at each end of the table. Reciprocation of the operation permitted the operator to unload and load the fixture at one end of the table while the cut took place on the other. The feed rate was lowered to 19 in. per min. because it was found that this balanced the required loading time. The lower feed produced somewhat longer life of the cutter.

For finish milling this operation, we employed the original cutters with an increased feed of 7½ in. per min. An interesting experience was gained at the inception of this change. Reasoning that the minimum amount of material to be removed at the finishing cut would give us the highest feed and accuracy, we removed all but 0.005 in. on the roughing cut. However, the finish proved totally unsatisfactory because of chatter of the cutters. By increasing the amount of material to be removed by the finish cut to 0.020 in., enough drag was left on the driving mechanism of the horizontal milling machine to eliminate all back lash. This permitted an increase of the feed to 9¼ in. per min.

But still we were not satisfied with the output. We have since provided additional fixtures to permit milling two parts abreast, and reciprocate, i.e., double fixtures at each end of the table, to enable the operator to load while the machine is taking the cut. Better cutter materials, such as 12 per cent cobalt, are now being employed to obtain primarily longer life per grind. We had considered the use of cemented carbide cutters, but the unusually high first cost for these interlocking cutters and the impossibility of recovering the investment by savings in the probable life of the part made us decide against the application.

The ½-in. slot that is shown extending half way over the length of the piece, as well as the shorter 0.875-in. wide slot, originally were milled at a feed of 4¼ in. per min. Investigation showed that the tolerances were unnecessarily close, and after correction, the feed was stepped up to 9¼ in. per min. and a double fixture was employed. The output per hour today on this operation is, therefore, approximately 350 per cent higher than before. Because of this, and similar steps taken on the remaining milling operations, the original output of 0.44 pieces per hr., of all milling operations, has been increased to 0.87 pieces.

These two jobs, as reported here, are typical of the methods employed to reach satisfactory performance of machine tool operation. They clearly demonstrate that there is no wild stepping up of feeds and speeds, but that there is logical thought behind every move that is being made. Naturally, it is not necessary on all jobs, to take devious steps to arrive at the ultimate result. This all depends upon the manufacturing quantities, the continuity of life of the product and, therefore, the amount of money that may justifiably be spent for increased production. Furthermore, as a result of experience that we gain on one product, we can frequently take the same steps at once on similar parts. For instance, the experience gained on the Bakelite plugboard resulted in stepping up the feed rate from 3¼ in. per min. to rapid traverse at 100 in. per min. on another Bakelite job where only one single slot had to be produced.

The process engineer on milling machine practice conducts two classes a week on milling machine practice. He not only teaches the fundamentals of milling machine work, but discusses steps similar to those outlined in this article with the very men who are called upon to carry out the actual operations. Being, so to speak, taken into confidence in the motives behind all these changes, the men really take an active interest. A goodly part of the savings thus made is returned to them in their pay envelopes in higher day rates, and this, undoubtedly, also tends to stimulate their interest and cooperation.

How Would You File Rolled Tracings?

F. E. DANIELS
Principal Chemist, Pennsylvania Department of Health

The paragraph asking for suggestions for filing large rolled tracings (*AM*—Vol. 80, page 328) is first amusing and then shows a very common trait of human nature. The chief engineer has invited criticism when he deliberately stated that "it is necessary to 'paw' over" 25 rolls whenever one is needed. What I can't possibly understand is why he did not dump them in so that he would have the delightful job of "pawing" over the whole 200. I note that he stated that they "are kept" instead of filed.

A file is a place to keep things so in order that anything wanted may be located and obtained instantly without disturbing the rest of the file.

This necessitates an arrangement in strict conformity with an alphabetical index or an arrangement in logical or alphabetical sequence so that it forms its own index. In this case each roll must have a definite and only *one* place, and *must* be returned to that very place and no other.

Each tracing should be tightly rolled on a stick, on one end of which is such designation as will identify the tracing and its proper place in the file. Or if not too bulky they could be rolled and slid into pasteboard tubes.

The rolls or tubes may be filed in shallow drawers, the ends of the rolls or tubes with the identifications, against the front of the drawers which are hinged to drop and show what the drawers contain in proper order. Partitions or even square strips of wood may be fastened to keep the rolls in place and to hold open the spaces of the rolls taken out.

Another way is to file the rolls vertically in partitioned off cabinets.

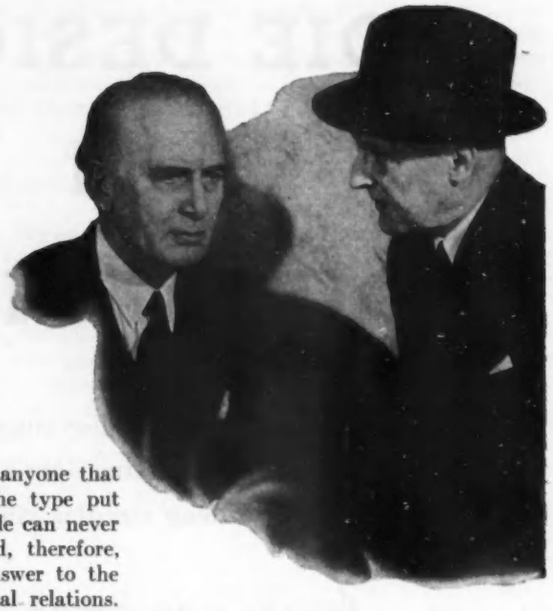
In this manner the writer keeps his stock of 6 ft. lengths of laboratory glass tubing. The cabinet is hinged to the floor and is pulled forward until a chain holds it at about 45 deg. The tube suitable is picked out by observing each stock of sizes on the end, after which the cabinet is pushed back upright against the wall.

I believe if the chief engineer will just think over the necessary conditions he must fulfill he should have no difficulty at all in designing a file most suitable to his own particular case.

The conditions are:

1. A definite place for each roll.
2. A good serviceable index to tell the place of each.
3. A cabinet so designed that each roll is readily accessible.
4. Sufficient amount of "guts" to see that the system is always carried out.

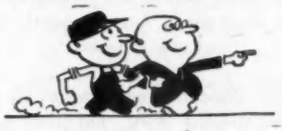
Talking Shop



Collective Bargaining

From what the labor leaders and some of the New Deal politicians say one would be inclined to think that collective bargaining is the final answer to all industrial differences of opinion. That might be the case if we were to accept the theory that warfare is the natural state of relations between employer and employee. While the New Deal has done much to bring this state of affairs to pass, the fact remains that collective bargaining is only one step on the way to satisfactory industrial relations.

A seasoned veteran in this field remarked the other day that the ideal situation exists when employer and employees work together with mutual



confidence to a common end. Such a condition exists in many a small shop where the employer and his men understand and respect each other. It is somewhat more difficult to achieve where the number of employees is large. Probably the best way of handling industrial relations in the larger plant is through some sort of employee relations plan. As this veteran expressed it the successful plan goes through three stages.

The first one consists of getting acquainted and building up mutual trust and respect between the management and the workers' representatives. This often takes two years and sometimes longer.

The second stage is the collective bargaining stage where the two sides begin to understand each other and negotiate their differences. Many plans never get beyond this stage.

The third stage is reached when the two groups get together for a friendly discussion of common problems recognizing that their interests are identical. Only the best plans reach this last stage.

It should be evident to anyone that collective bargaining of the type put forward by the labor people can never reach the third stage and, therefore, cannot be the ultimate answer to the whole question of industrial relations. We shall have to find something better if we are to achieve real success in manufacturing.

The Next Depression

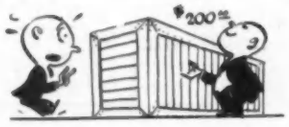
While most of us are pretty busy getting accustomed to the recovery that is now fairly well advanced, and trying to repair the damages of the depression, a few far-sighted ones are beginning to lay their plans for the next depression. Thinking about depression while one is in the early stages of recovery may not be a very pleasant occupation nor a very popular one yet it is a wise thing to do.

One of these far-sighted gentlemen who happens to be an economist suggests some of the things that ought to be done before trouble overtakes us once more. Among these he warns against the type of installment buying that ignores a substantial down payment. He points out that we have no adequate figures on the extent of installment buying that is going on

today and that we need them. He would repeal the tax on surplus at once because of its dire effect when the prosperity wave passes its peak, and he would urge employees to study the effect of the surplus tax on them and to make their voice heard in political quarters. He would have companies and individuals reduce their debts and he would encourage employees to save so that they can be in a position to spend when prices drop. Finally he would have companies improve their accounting practice to make sure that every unit sold carries its fair share of the overhead.

How Much For Crates?

Managers of machinery building companies are beginning to question the high cost of crates. They recognize the necessity of complete protection for a precision product, especially



when it is to be exported, but when they look at cost sheets that show crating expense as high as $200 for a single machine they begin to wonder if they are not doing too good a job.

It's a difficult question to decide. A company that spends relatively little for crating reports one case of material damage in 300 shipments. Did the cost of making good on that one failure equal the cost of entirely adequate crates for the whole 300, or did it not? One of the mail order houses keeps careful statistics of smashes and uses crates just strong enough to "get by". This method would hardly do for the builder of expensive machinery, because failures would be so costly, and because there is hardly volume enough on which to get accurate statistics.

Probably the best way to get an answer is to call in a qualified consultant.

DIE DESIGN and DIE MAKING

XV—Two more drawing dies show such diversified operations as making domes at the edges of a sheet and a deep circular ring in a blank

E. G. MARSHALL

Master Mechanic, Charleston Works,
The American Fork & Hoe Company

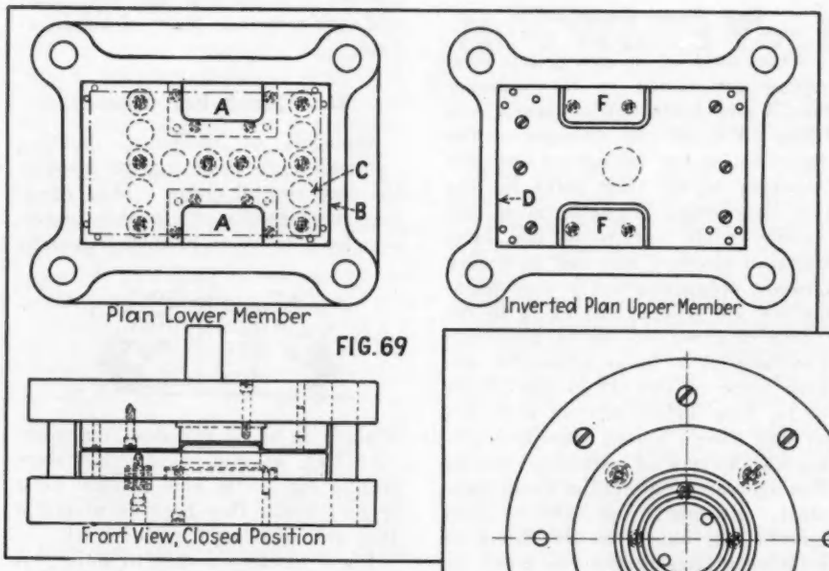


FIG. 69

A BLANKING and drawing die, shown in Fig. 68, produces the burner for a wickless kerosene oil stove. The part is made from $\frac{1}{16}$-in. cold-rolled steel annealed to a dead-soft condition. The sequence of operations after the press is tripped is as follows:

1. The blank is cut out of the strip at the edge *A*.

2. The upper member draws the metal at *B* and *C* over the lower ring at *D*. In this case the metal draws from both sides toward the radius *D*.

3. As drawing continues the ring at *B* and *F* is formed.

4. The parts bottom and set the strain in the metal.

5. As the upper member returns to the starting position the knock-out ring ejects the part.

The lower drawing ring *G* is made of oil-hardening tool steel and hardened and ground. It is screwed and doweled to the center of the lower member. The upper forming punch *H* is made of water-hardening, wear-resisting tool steel and hardened. It is screwed and doweled to the upper member in line with the lower die, and the lower end is machined to fit the contour of the part, as shown in the sectional view.

The combined upper drawing die and blanking punch *K* is attached to the upper member with screws and dowels. The part is made of water-hardening tool steel and the inside is machined to fit the part and to iron it

Fig. 69—Slight bulging will probably occur when domes are drawn in the edges of a sheet, but frequently it is of no moment

Fig. 68—Fractures occurred at the top of the longest draw, but they were overcome by making the working surfaces of the die very smooth

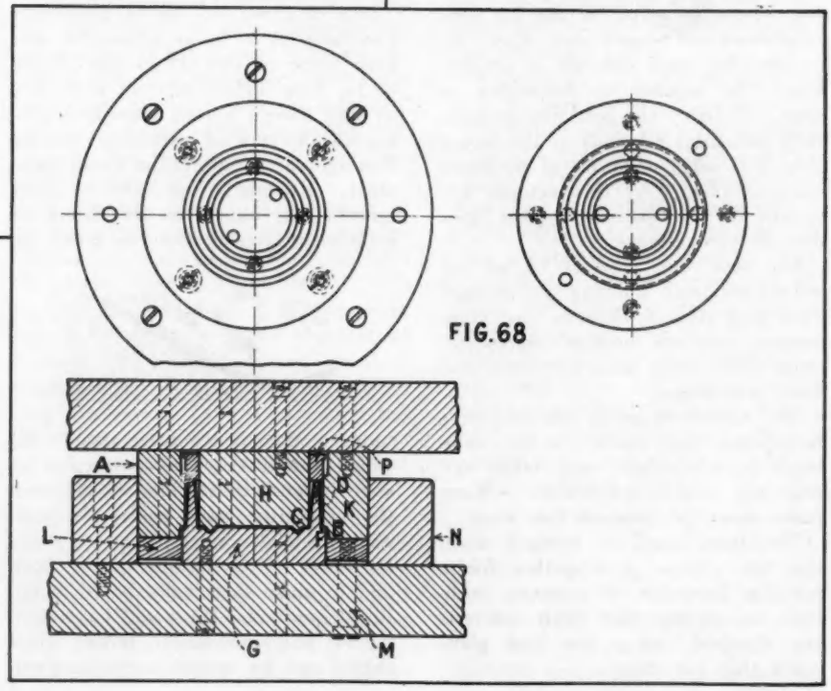


FIG. 68

out on the lower ring. The outside is left unfinished.

A knock-out ring *P* was machined to a snug sliding fit between *H* and *K*, and a heel was left on the top for retaining purposes. This ring is operated by the knockout pins, which in turn are operated by the punch press. It is made of tool steel and hardened.

Pressure ring *L* was roughed out and the inside finished to a free sliding fit over *G*. Shoulder screws *M* are screwed into it, the heads extending below the die shoe when in the up position and resting on the spring washer below.

Both *L* and *M* were made of tool steel and hardened. The die was then tried out with hand-made blanks until the desired part was produced. The pressure ring *L* and the blanking punch *K* were ground to the desired size. Blanking die *N* was then made of tool steel, hardened and ground. The inside was ground to suit the punch size plus the amount added for clearance because of the metal thickness.

Two draws at the edge of the sheet are made by the die shown in Fig. 69. The part fits under a business machine and the draws furnish hand holes on the sides. Cold-rolled steel, annealed dead-soft and $\frac{1}{16}$ in. thick, was used. The blank was located by dowels driven in the lower pressure pad. As the upper member comes down it contacts the part on the pressure pad, the pad yields and the metal is drawn over the two drawing punches. The upper member moves down far enough to bottom and returns to its starting position. No trouble was experienced with wrinkles on this piece, but the strain caused a slight bulge in the center. The bulge flattened out when the piece was screwed to the machine.

Two punches *A* are screwed and doweled to the lower member, and pressure plate *B* is attached to the lower member with shoulder screws. It is held under pressure by springs *C*. Die block *D* was screwed and doweled to the upper member, and the inserts *F* were employed to iron out the metal on top of the dome.

Part XVI of *Die Design and Die Making* will appear in an early number.

Knurled Thumbscrews for Tool Work

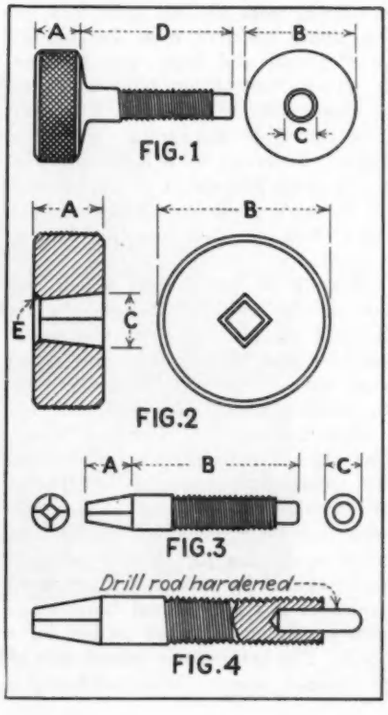
CHARLES WESLOW

Mr. Weslow says that the toolmaker should not have to waste time making knurled thumbscrews to suit jigs. He thinks that an enterprising manufacturer should offer a standardized line of knurled heads and tanged screws for assembly to suit the job

IN MY TIME, I have made so many knurled thumbscrews for jigs and fixtures that I am beginning to think that some manufacturer of screws should produce them in various sizes, in much the same way as jig bushings are manufactured. The old timer in Fig. 1 is for holding a part securely against a stop in a drill jig. Very often two or three such screws are employed. Dimensions *A*, *B*, *C* and *D* can be varied depending on how much pressure is required to hold the part securely. Sometimes there is not much room for a large screw body and it is obvious that the knurled head should not be so large as to allow the application of too much force.

There are concerns which manufacture cast-iron knobs to be fitted to the body of the screw and pinned together, but I find that very often these knobs are too clumsy in comparison to the size of the screw. Often in the design of the jig there is no room for such a cumbersome knob.

This idea of separate knobs and screws, however, could be applied by a screw manufacturer as shown in Figs. 2 and 3. The screws should be made in sizes ranging from ¼ to ½ in. and be capable of being driven into various sized heads, depending on the desire of the toolmaker. The tang *A* in Fig. 3 should be about ⅛ in. longer than the thickness of the knurled head, so that the square body can be riveted over into a chamfer as at *E* in Fig. 2. Some heads should have the same thickness *A*, but various dimensions for *B* and C. Sometimes a toolmaker may want to fasten a head ¾ in. in diameter to a ⅜-in. screw and again he may want to use a head 1½ in. in diameter, but of a smaller thickness *A*, with the same size screw. If such heads and screws were available, he would save considerable time in making the jig or fixture.



The point of the screw should be pack hardened. If pack hardening is out of the question a short piece of hardened drill rod should be inserted as in Fig. 4. Otherwise the point will soon get worn and spoiled. The taper part of the screw should fit nicely into the taper of the head, and the taper should be of an amount that will cause the two parts to adhere together, like the tang of a drill shank to a chuck. Moreover, the taper can be large enough so as to make manufacturing an easy problem. The toolmaker can depend a great deal on riveting the two members together.

•

Consolidating Repair Work

One of the suggestions of the recent Eastman report on railroads is the "joint utilization of repair shops as a means of reducing operating expenses." Which reminds us that the shop of the University of Mukden, Manchuria, was handling all the repairs of several small railways in 1929. One lone American machine tool among German equipment and a German shop superintendent kept both locomotives and cars in operating condition. Whether or not this still exists under the new regime the idea has precedent in an unexpected quarter.

KINCAID'S COAL

Thomas T. Taber, Madison, N. J.

Early Lackawanna locomotive with cab moved forward to allow rebuilding of wider firebox for burning "culm," small, chipped anthracite which was formerly wasted

MY GRANDFATHER was a gunsmith in his own little shop in the mountains of Pennsylvania north of Scranton. Working with him until he was 17, my father learned the old methods of doing machine work in a shop with little machine equipment. Boring and rifling a barrel was a real job in those days, especially with "gain twist," or increasing helical angle of the rifle grooves. Taps were not threaded in a lathe because there was no screw cutting attachment. The threads were filed in square stock after the angle and pitch were laid out.

When he was 17 he went to firing a wood burning locomotive on the Lackawanna railroad and was an engineer at 21, in Civil War days. Although he left the railroad when about 30 years of age, he always retained a deep interest in railroading and spent many hours in railway shops and with railway men. He and I spent many a Sunday morning in railway roundhouses and my first mechanical interests were along locomotive lines. Father had a splendid railway library, and this, coupled with a marvelous memory, made him an authority on railroad history and he was consulted by many well known men of that time.

Among his close friends were M. N. Forney, a well known authority and editor, J. Snowden Bell and Waldo Marshall, later president of the American Locomotive Works. I fell heir to many of these friendships and owe much to the kindly advice of the three named, as well as to George Basford, whose passing at an early age was a great loss, to George Fowler, Robert Grimshaw and others. The latter is still with us, at a ripe old age.

It was father's railway knowledge that brought him into close contact with John Hill when he was editing *The Locomotive Engineer* in the old *American Machinist* office at 96 Fulton St., as I have mentioned before. There were few months during this time that John did not visit us in Philadelphia to discuss railway subjects with Father. These connections were of great value to me when I joined Angus Sinclair on *Locomotive Engineering*, as the paper was then called, after Hill and Sinclair split in 1897.

Saw First Mechanical Stoker on C. & O.

This was a period of great activity in railway work and my work took me into many quarters, from Jacksonville to Montreal and from east to west. It was on one of my trips into Ohio in about 1900 or 1901 that I bumped into the first mechanical or power stoker. Invented by a locomotive engineer, John Kincaid, it was being tried on the ever progressive Chesapeake & Ohio Railroad, on which Kincaid worked.

Hearing of the stoker, which was not widely heralded, I tried to see Kincaid at his home in Cincinnati, only to find that he and the stoker were out on the road, somewhere between there and Washington.

With the cooperation of C. & O. railway officials in Cincinnati I found that the locomotive would be at Hinton, W. Va. the following day, so I started after it. After some vicissitudes I arrived in Hinton just before midnight and was met by the master mechanic, to whom my arrival had been wired, and was taken to what passed for a hotel. The hotel coach (which met all the trains) was so dilapidated that I wondered how is ever held together.

At the hotel I was shown to a large room, with a soft coal fire in the fireplace, as it was fall, and three doors to the room, none of which would lock. Fortunately, there were three chairs which I could jam under the door knobs. Then I climbed into the high bed and was soon dead to the world, after leaving a call for an early breakfast.

The morning was dark and misty, but I hunted up a place to buy a suit of overalls and presented my credentials to the engineer who was to take the locomotive out that day. The stoker was of the plunger type, which shot the coal over a spreader plate at the front near the firebox door. As I recall it there were three adjustments to the steam driven plunger so that the first stroke would spread the coal just inside the firebox door, the second, a harder stroke, placed it about the middle of the box, while the third shot it into the far corners. Then it would automatically repeat the sequence. And it did a remarkably good job.

Clad in overalls I was given the fireman's seat and we started for Clifton Forge, hauling a long, heavy train of coal cars up over the mountains, and past the famous White Sulphur Springs. It was a long, hard trip in those days. Running time was slow and it was a single track road. The locomotive was of consolidation or 2-8-0 type as we now designate it, and was called "big Liz" by the men.

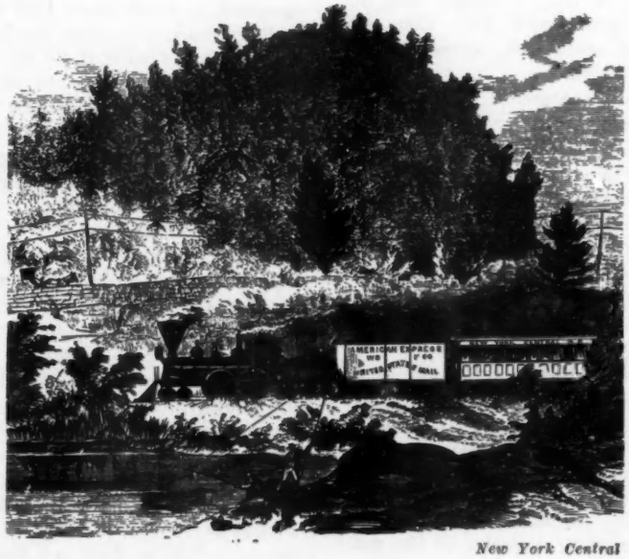
The C. & O. has a long tunnel at the top of the mountains, something over a mile long as I remember, with the grade breaking both ways from the

KICKER

The First Locomotive Stoker

XIII—Wherein the secret of a veteran editor's early interest in locomotives is divulged, how he reported the first engine stoker—and got smoke in his lungs

FRED H. COLVIN
Editor



New York Central

center of the tunnel, toward each end. It was, at that time at least, a small tunnel, ample for the days in which it was built, but not leaving much room for gases when locomotives of the size of big Liz went through. And until the locomotive and train broke over the top in the center, there was plenty of gas loose in the tunnel.

Just previous to our trip there had been trouble in the tunnel. A locomotive had stalled before getting to the center, and in trying to get it started again the engineer had been overcome by gas. So just before we reached the tunnel the fireman handed me a piece of clean waste, saturated with water from the tank valve. This was to hold over my mouth and nose as a sort of gas mask. "And if we stall in the tunnel," said the engineer, "get down off the engine and keep near the ground. And don't waste any time doing it." The gases of course were much less dangerous near the ground.

As we got into the tunnel the smoke and gas promptly began to accumulate. The air grew thick and foggy and it was not long before the engineer and all his paraphernalia disappeared from my view. Only the chug, chug of the exhausts resembled a locomotive. The air grew thicker and more laden with gas. The light of the gage lamp not over 3 feet away disappeared from view. I'm not sure whether it went out for lack of oxygen or just faded away in the smoke. Probably the latter, for things happened after we got through the tunnel which put the gage lamp out of mind.

"Big Liz" did herelf proud and we broke over the top of the grade with no indication of stalling. After that the tension abated as more of the long string of cars broke over the top and began to roll down. But it was not until the end of the tunnel that the engineer again came into view. All this time the stoker was doing its job and the locomotive never lacked for steam.

Just after we came into daylight, the cab window on my side, which was hinged at the top and swung up to the cab roof, broke loose from its moorings and swung down on my head with a bang! Due either to the thinness of the glass or the thickness of the head, the head went through and most of the glass with it. So much glass broke out that none of it touched me but the fireman made a dash in my direction to see just what had happened.

A Ride to Be Remembered

I have ridden in locomotive cabs many times, though not for many years. But that trip stands out in many ways as the most interesting. Watching the stoker doing its job without a hitch, seeing the interest of the men at the different stopping points, the tunnel and its gas, all left a deep impression. And in spite of the gas mask in the shape of a wet piece of waste, I tasted sulphur for a week, more or less. The blotting out of all objects in the cab, the heavy odor of sulphur, the steady throb of the parts of the locomotive as each performed its duty, was a not to be forgotten experience. With that as a background I wrote what was probably the first story of locomotive stokers that appeared in a technical periodical.

The Kincaid stoker never became popular. Perhaps it was ahead of its time or not handled by the right people to introduce it as Diamond Jim Brady might have done. But it was a beginning, and stokers are today standard equipment on all large coal burning locomotives.

SHOULD "Not Go" THREAD GAGES BE TRUNCATED?

This authority says they should if National Screw Thread standards are to be maintained

H. W. BEARCE
National Bureau of Standards

IN THE last report of the National Screw Thread Commission (Miscellaneous Publication No. 141, National Bureau of Standards), it is recommended that the thread form of "not go" thread plug gages be truncated below the basic major diameter by an amount equal to 1/6 the basic thread depth. Certain manufacturers of nuts, through their standardization committee, have objected to this recommended practice on the ground that the use of truncated "not go" gages results in the rejection of nuts that would be accepted by full form gages, and which are entirely satisfactory for many purposes.

While there can be no doubt that in certain cases truncated "not go" gages will reject nuts that would be passed by full form gages, that, in itself, cannot be accepted as a valid objection to the use of truncated gages, since in most such cases the nuts rejected by a truncated "not go" gage are not within specifications and, therefore, ought to be rejected.

In general, if the lead and angle of thread are correct, it makes little difference whether nuts are inspected with truncated or with full form "not go" gages. If passed by one they will be passed by the other, and if rejected by one they will be rejected by the other. On the other hand, if the thread angle is seriously in error, nuts that are accepted by a full form "not go" gage may be rejected by a truncated gage. This is what the manufacturers object to. Their objections appear to be not well taken, since it has not been shown, or even claimed, that truncated "not go" gages, of correct design and dimensions, will reject nuts that are within the recognized tolerances for each class of fit.

It is a well recognized principle that "go" gages check several elements simultaneously and insure assembly of product, while "not go" gages check only a single element for each gage and insure only that on that particular element the assembled products will not be excessively loose. Because of its importance in determining the character and[1] permanence of fit, the pitch diameter of screw threads is the element usually selected as the one to be checked by the "not go" gages.

Strictly speaking, the "not go" plug gage, in order to check pitch diameter, should be so reduced in major diameter and so cleared below the pitch line, that it can make contact only at or near the pitch diameter of the nut. Obviously if the "not go" gage is made to the full major diameter, or if it is not properly cleared at the minor diameter, there may be interference at the major or minor diameter and nuts may be passed that are far above the maximum permissible pitch diameter. This is particularly true if the thread angle of the nut is seriously in error, and it is well known that this is one of the most common faults in commercial nuts.

It is held by certain manufacturers that nuts rejected by a truncated "not go" gage, as not falling within a given class, are nevertheless, entirely satisfactory for many purposes and should not, therefore, be rejected. While it may well be, as claimed, that many of these rejected nuts are satisfactory for certain purposes, the fact remains that they are not within the dimensional limits of the class specified, as otherwise they would not be rejected by a correct truncated "not go" gage.

It may safely be assumed that when a designer or purchaser of parts specifies nuts of a given class, he does so in the belief that nuts of that class will do that particular job more satisfactorily than will nuts of some lower class. It would seem that he should be entitled to receive, and should receive, nuts of the class specified and paid for, instead of nuts of some lower class, or no class at all, which someone else may think will do the job equally well.

No Substitute for Quality

If the manufacturer is unwilling or unable to furnish nuts of the class specified, it would seem that he might well give his attention to improving his equipment so that he can produce the class specified, or to selling the idea that the class which he can produce will satisfactorily serve the purpose, instead of attempting, by the use of incorrect or inadequate gaging practices, to substitute nuts of a lower class.

If, in the course of time, it is found that the screw thread tolerances, as set up by the National Screw Thread Commission and subsequently adopted by the American Standards Association as an American Standard, are unduly severe, then the way is open for any revision that may be found necessary. In the meantime it is believed that in the interest of progress and uniformity of practice these tolerances should be strictly adhered to, and the use of full form "not go" thread plug gages should be discouraged.

[1] The basic principle of "not go" gaging s clearly set forth by Hilding Torner bohm in *Mechanical Engineering* for July, 1936; (*AM*—Vol. 80, page 547).

* Publication approved by the director of the National Bureau of Standards.

Editorials

AMERICAN MACHINIST ESTABLISHED 1877
VOLUME 80 NUMBER 23
K. H. CONDIT • F. H. COLVIN
EDITORS

TAX REVISION FIRST

NOW that we have elected a President to serve for four years we can turn our attention to several things that have to be done as soon as possible. These things have nothing to do with partisan politics.

In our leading article in this number we have discussed the Social Security Act and have given our reasons for believing that it has no place in partisan politics. There will be plenty of time to debate its merits and the amendments that will have to be made to it, because all of its provisions do not become fully effective for several years.

We still have the unemployment problem despite the splendid job industry has done in getting men back on the payrolls. We have not found the answer to that problem, and we shall not find it until we straighten out our thinking on the tax question.

Far too many of our taxes are of the indirect or invisible variety dear to the politician because many of those on whom they bear hardest don't realize that they are carrying the load in hidden costs on what they buy. Few men in legislative circles have the courage to face this fact and to advocate open taxes that would bring home to the taxpayer what his government is costing him. These few should have the support of those who have the interests of the country and of the wage earners really at heart.

Revision of the whole tax structure—federal, state and municipal—will take time, but there is one piece of tax revision that can be done at once. It should be the first order of business in the new Congress. We refer to the so-called Surplus Tax Law.

Just what those who proposed it and voted for it hoped it would accomplish is something of a mystery. Probably they expected it would embarrass the big corporations and act to shrink them and their importance. But as they passed it it affects but little the big corporations that already have substantial surpluses and makes it prohibitively expensive for the small corporations that are relatively young to build surpluses. It makes difficult the provision of a reasonable surplus to tide any corporation and its employees over the next depression that hits us. In so doing it does even more thoroughly what so much of the recent tax legislation has done quite well—bear hardest on the wage earner. He needs a job when times are bad. An adequate surplus is the only source from which his wages can come when sales fail and the company has to fall back on maintenance and repair jobs to keep its employees going.

There is much more to be said on repeal of the Surplus Tax Law, and we shall have more to say later. In the meantime those of you who are close to your Congressmen should lose no time in impressing upon them the vital need for at least this much tax revision—at once.

How Many Apprentices?

SHOP MANAGERS are realizing the necessity of training apprentices, and a large number of plants have apprenticeship courses of a more or less complete nature. One such manager is trying to determine the number of such apprentices that he should carry and train. He has been tentatively figuring on one boy for every eight machinists, or 12½ per cent. This is a plant in which labor turnover is small, and the average length of service is much longer than in the average shop.

The number of apprentices needed to maintain a constant supply depends largely on the type of business and the kind of management. If the business is seasonal or has wide fluctuations the problem is made more difficult. Then, too, if the management lays men off at the first slackening of orders it will lose a larger number of men than where the policy is to build a bank of stock to smooth out employment fluctuations.

The firm mentioned exerts great effort to build and maintain morale in its workers. It realizes that stability of employment is more important than hourly wage although this does not imply a lower than prevailing rate. Recognition of the worker as an individual, and a friendly spirit in all dealings, are important factors in successful management and vitally affect the turnover. And turnover has a direct bearing on the number of apprentices necessary. Then, too, the locality may affect the problem. If other shops also train boys, fewer may be needed than where some shops lure men away from those who train them.

Those who recall the efforts made during the war to train employees, and the stress laid on the cost of turnover, will realize the ground that has been lost during the past few years. Unless we again give these phases the attention they deserve we cannot hope to reap the full benefit of returning business.

Chips

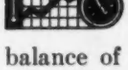
WASHINGTON—Social Security Board asks bids on printing of forms for registering those coming under the terms of the Act, issues attack on manufacturers for alleged misrepresentation in notices to workers . . . Supreme Court agrees to pass on three cases brought to test the constitutionality of the Wagner Labor Act . . . Army orders 117 basic training planes from North American Aviation.

FOREIGN—Hitler appoints Goering to head up "4-year plan" thus making him second in authority only to the Fuehrer himself . . . Huge airplane and airport developments shown to American observers by Reich officials . . . Soviets threaten to withdraw from Spanish neutrality pact, but think better of it under British and French diplomatic pressure, send arms to defenders of Madrid as foes close in on defenders . . . Rumor that Stalin will come here for medical advice denied in Moscow, he tells correspondents he is dead and please leave him in peace . . . British consider expediting aerial defense program by placing large orders with American firms, order 300 planes from Canadian Boeing . . . Italy and Germany get together on 6-point program involving agreement on stand against Communism . . . England has to curb enthusiasm of Mosley's Fascists . . . Hereafter Germans may read only books written by Nazis—Goebbels order . . . French program for military aviation sets record . . . Australia inquiries for American military planes fearing inability to get orders filled in England . . . Nazi paper says Czechs are building forts in border zone . . . France adopts double budget of New Deal pattern.

FINANCE—Third quarter income tax collections exceed billion for first time since 1928 . . . AT&T sets record by calling $200,000,000 in bonds . . . French devaluation likely to open door to American security trading on Paris Bourse . . . September RFC receipts exceeded expenditures.

INDUSTRY—Dewey strikes at New York labor racketeering by securing indictments of 14, raids bakery files to get evidence on racketeers in that field . . . Nash and Kelvinator merger is approved by directors of the two companies . . . Railroads petition ICC to set aside existing freight rates and revise the whole structure, generally downward . . . Maritime Commission rules that new bids for U. S. Lines companion ship to the Washington are necessary . . . K. C. Southern orders ten fast freight locomotives from Lima . . . U. S. Steel announces payment of full preferred dividend and plan for graduated wage increases to be submitted to works councils . . . Burlington will spend $8,000,000 for freight cars.

TRADE—Canada reaches trade agreement with Germany which is practically on a barter basis . . . Commerce Department forecasts big gains in foreign trade for 1936.



INDICATORS—Steel production rate expected to stay near 75 per cent for balance of year . . . Electric power output off but still 14 per cent above 1935 . . . Business Week's index at 75.3, off a little.

Metal Congress Marks Progress In Products and Research Work

CLEVELAND—Two things impressed the visitor to the National Metal Congress and Exposition during the week of October 19-23. One was the excellence in the technical papers presented before the American Society for Metals and the four cooperating groups, the American Welding Society, the Wire Association, the American Society of Mechanical Engineers and the American Institute of Mining and Metallurgical Engineers. For the most part the papers were based on painstaking scientific experience; packed meeting rooms gave evidence of the fact that hearers were hungry for the detailed facts contained in them.

Another impressive part of the meeting was the Exposition. New materials and equipment drew crowds to the booths because of their contributions to industry and because of the attractive displays. Exhibitors were well pleased with the material interest shown by the 12,000 visitors who passed their booths and with the orders incident to their efforts.

Since programs of Congress papers have already appeared in these pages (*AM*—Vol. 80, page 825f) no attempt will be made to recapitulate them here. One of the popular features was the series of lectures on "Physical Testing of Metals" by Prof. H. D. Churchill, Case School of Applied Science. Another was Dr. Kent R. Van Horn's lectures on X-ray analysis.

Annual dinners were held during the week by the A.S.M. the A.W.S., the A.I.M.E. and the Wire Association. At the A.S.M. dinner J. P. Gill, Vanadium Alloys Steel Co., was awarded a certificate for his delivery of the Edward De Mille Campbell Memorial lecture and William R. Chapin, research director, E. C. Atkins & Co., received the Albert Sauveur Achievement Medal. H. V. Kaltenborn, radio commentator, entertained the guests with an account of his trip to the Spanish war zone. A novel event at the dinner was the honoring of the secretaries of ten chapters who had served for ten years or more. Among the distinguished guests at the speakers table was Ben Fairless, president, Carnegie Illinois Steel Co. Robert S. Archer, retiring A.S.M. president, acted as toastmaster.

The Samuel Wylie Miller Medal of the A.W.S. went to Henry M. Hobart, consulting engineer of the General Electric Co. One of the speakers at the A.I.M.E. dinner was W. R. Barclay, president, British Institute of Metals.

TO STUDY DISTRIBUTION

A special committee to study the question of distribution, including all phases of the Robinson-Patman Act, has been appointed by the Chamber of Commerce of the United States, Washington, D. C.

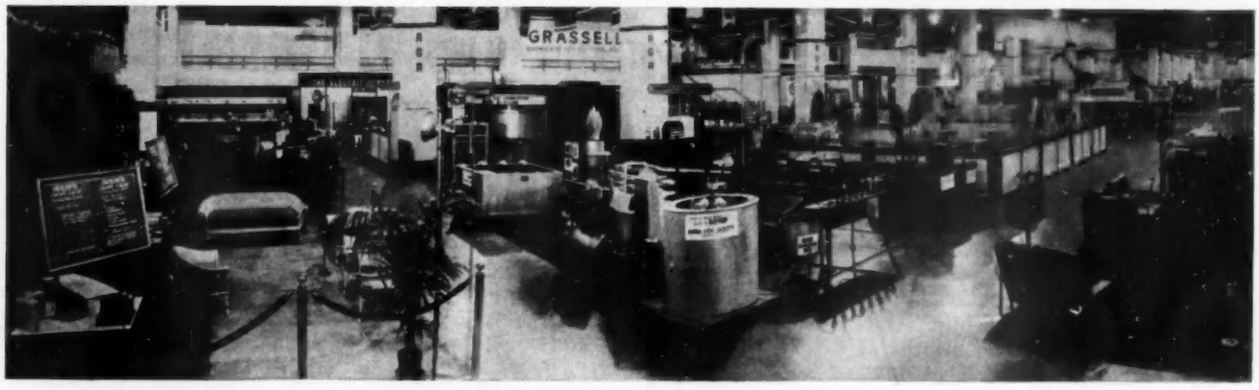
Business organizations are invited to submit their questions or specific problems to the committee.

▼

A. E. Gibson, vice-president, Wellman Engineering Co., and newly elected president of the American Welding Society, takes a good look at Linde Air Product's flame cutting demonstration

Housed in Cleveland's Public Auditorium, the 1936 Metal Exposition attracted 12,000 visitors, set a new high in interest and attractive displays

▲



Industries At Highest Mark Since Early 1930

September Production Hits 109, With Further Gains Indicated

Beside reaching a new high for six and a half years in September, industrial production through the first three quarters of this year has maintained the highest level for any such period since 1929. A still further advance is indicated for this month, the Board of Governors of the Federal Reserve System disclosed in its index of industrial production for last month. The index, adjusted for seasonal variations, in September stood at 109 per cent of the 1923-25 average, reaching this peak for the first time since February, 1930.

The index also revealed that during the first nine months of the year production had averaged above "normal", averaging 101.5 compared with 100.1 for same period of 1930, the last normal period, and 12.4 for 1929.

The index has been above 100 per cent of the 1923-29 average, taken as normal, for the last six consecutive months, a record not equalled since 1929.

The board in its monthly business summary also noted increased commercial loans by banks, stable commodity prices, and increased employment, crops, retail sales, and carloadings.

September Recovery Found 72% of 1929-1932 Slump

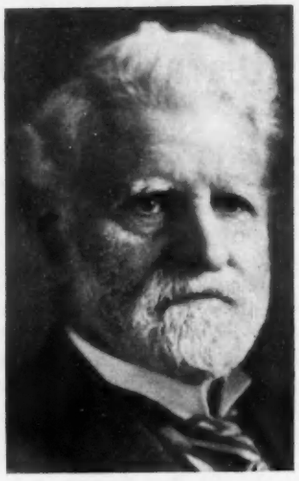
Industrial Conference Board Shows Gains in Basic Fields

Industrial output in September was maintained at a level representing a recovery of approximately 72 per cent of the 1929-1932 decline, according to the National Industrial Conference Board.

Substantial increases were reported in electric power output, retail sales, cotton and silk consumption, and lumber production. These were counterbalanced by seasonal curtailment in the automobile industry, and some recession in the construction, petroleum, and machine tool industries. Automobile production, due to the change-over period, was curtailed sharply.

Average daily pig iron production was larger in September than for any month in more than six years. Steel ingot production, on a seasonally adjusted basis, advanced slightly. Output during the first nine months of 1936 was greater than all of 1935.

Will Receive Hoover Medal



Harris D. Ewing

AMBROSE SWASEY

Ambrose Swasey, chairman of the Warner & Swasey Co., Cleveland, has been cited by representatives of America's four ranking engineering societies to receive the Hoover Gold Medal "awarded by engineers to a fellow engineer for distinguished service." The medal will be presented to Mr. Swasey, a builder of machine tools and precision instruments for 67 years, on the occasion of the American Society of Mechanical Engineers annual dinner at Hotel Astor, New York City, Dec. 2.

Mr. Swasey, who celebrates his 90th birthday on Dec. 19, has devoted his life to the development of tools and scientific instruments which have been of strategic importance in the progress of production methods, navigation, military defense and astronomy. His initial gift in 1914 established the Engineering Foundation "for the furtherance of research in science and engineering for the good of mankind."

The Hoover medal was created by Conrad N. Lauer, Philadelphia, to commemorate the achievements of Herbert Hoover.

GERMAN MACHINERY DEMANDS SHOWS CONTINUED INCREASES

The German machine manufacturing industry was occupied in September to 84 per cent of capacity against 82 per cent in August. The principal demand is for capital goods, particularly plant for blast furnaces and rolling mills. Building machinery and machine tools are being well booked.

There has been a slackening in agricultural machinery, although exports so far this year are almost 50 per cent above the same period in 1935.

U S. Steel Plans Big Southern Development

$29,000,000 Will Be Spent On Alabama Steel Plant

Approximately $29,000,000 will be spent by the United States Steel Corp. on a development program for its Tennessee Coal, Iron & Railroad subsidiary at Birmingham, Ala., Myron C. Taylor, chairman of the parent corporation said recently.

Two batteries of coke ovens, a blooming mill, a continuous 48-in. strip mill, two continuus rolling mills and a tinning mill are part of the project outlined by Mr. Taylor.

"The tide has turned, the rhythm of recovery has been reestablished," Mr. Taylor told a group of business men at Birmingham in making the announcement. Capacity of the proposed continuous strip mill will be 300,000 tons a year, and two other rolling mills will produce 100,000 tons a year each. Additional employment of 2,500 is expected when the plant is running at capacity. Present employment is about 17,000.

The company was purchased by U. S. Steel in 1907, and was a pioneer southern steel plant. Its capacity then was about 500,000 tons, a third of its present capacity.

N.E.M.A. Establishes Welding Headquarters

Cooperative Development to Carry On Research Work

The National Electrical Manufacturers Association has established welding research and development headquarters in the Frick Bldg., Pittsburgh.

The welding section has initiated a program in which special attention will be given to application engineering, including the preparation of reliable information on cost savings through the use of electric welding, the preparation of material for the use of and cooperation with construction engineers, designers and architects, and the direct promotion of electric welding.

FRENCH AERO PLANTS MERGE

The first company formed under the French Government's plan to nationalize all airplane factories was constituted last week. It was formed by the fusion of the Breguet, Nieuport and Morane-Saulnier firms, which have factories in the region of Nantes and St. Nazaire, France.

Motors AND OTHER MATTERS

Auto output nears 100,000 a week . . . Huge pile of unfilled orders cheer builders . . . Sales artillery ready for action . . . More welding and broaching are 1937 trends . . . Huge machinery purchases mark 1936

BURNHAM FINNEY
Western Editor

DETROIT—With the New York Show only a week off, the motor industry is rapidly nearing a production pace of 100,000 units a week. Factory executives are beaming because of the huge piles of unfilled orders. Plymouth has over 90,000, Pontiac 45,000 and Buick 40,000. Two of the Big Three are in full swing; Chevrolet is assembling 4,000 cars a day and is heading for 6,000, while Plymouth is taxing its plant capacity.

A number of companies, including Hudson and Packard, will build far more cars this quarter than in the same quarter a year ago. After delays caused by last-minute switches in specifications, Ford is hurrying operations, although its dealers will be slower in getting cars than Chevrolet and Plymouth dealers.

Dealer Shows Ready

Chevrolet will fire its opening sales gun Nov. 7 following a series of dealer breakfasts attended by 50,000 employees around the country. The preceding day Ford will stage its first national dealer meeting with 7,000 dealers assembled in Detroit from the United States and Canada. In a dramatic setting new V-eights will be driven into the arena of the coliseum at the State fair grounds for their initial inspection. It is believed, however, that public announcement will be deferred until Nov. 14. The dubious distinction of being the last to introduce '37 models goes to Oldsmobile. It has had so many delays in securing delivery of production machinery that its dealers won't have cars ready for announcement until Nov. 15 or later.

Car manufacturers will adhere to previous practice of enticing a larger volume of business by offering more than ever before for the same amount of money. With few exceptions wheelbases are longer, cars heavier and bodies larger. Safety glass all around and in some cases windshield defrosters as well as other "extras" are now included as standard equipment.

Prices Down in Good Market

Paradoxically all companies above the lowest-price group are lowering prices to compete more successfully, yet the industry is convinced that people are willing to pay a little more for a car today than a year ago. Even Chevrolet doesn't intend to advertise prices at the beginning of the season, because it thinks $5 or $10 up or down doesn't make so much difference to the buyer as it did in the deep depression days. If keen competition between its various divisions is the life of General Motors business, evidently Chrysler thinks it a good policy. The Dodge four-door sedan for '37 is $745, De Soto $785 and Chrysler Royal six $815. That's getting the margin pretty thin. The Nash-Lafayette has been cut $75 to $90. Chrysler's reductions on the Royal run from $45 to $60. A financial pain in the neck since its first day, the Airflow no longer is found in the De Soto line, is relegated to two Chrysler models, coupe and four-door sedan, at $1,475. All Chrysler Imperials are priced under $1,000. The new LaSalle, with longer wheelbase and the same V-eight engine as the Cadillac 60, lists at $995, as against $1,175 the past year. A Cadillac 65 on a 131-inch wheelbase is an addition to the Cadillac-LaSalle line for '37, which is the most extensive of all General Motors divisions.

Ford is reported holding to the decision to offer the choice of a small V-eight motor or the standard-size engine in the same chassis. The small motor has two rustless steel sides (12 per cent nickel and 12 per cent chromium) welded to the cast iron block. Ford has been working for two years perfecting the method of welding rustless steel and cast iron together. Some observers see in this development the possibility of a radical change in the next five years in the method of making cylinder blocks. Blocks no longer will be cast in the foundry, they contend, but built up in welding jigs from stamped steel parts.

Chevrolet is relying for '37 on two cars on an 112-inch wheelbase—Master and Master De Luxe—instead of a Standard and a Master of different length as in the past year. Both have the same engines, bodies and mechanical features, but the higher-price car has knee action, better interior trim and more gadgets. Both have a box-girder type of frame somewhat similar in design to that used on the Standard last year and giving greater rigidity despite its lighter weight.

A distinguishing mark of all 1937 Chevrolets is a "speed line." The side flaps of the hood are shorter than heretofore, and the ledge on which they rest, between the front fender and engine compartment, is carried back as a horizontal offset diminishing toward the rear until it merges into the door panel.

Forged Camshafts are Few

Oldsmobile is now committed to cast iron brake drums of the centrifuse type similar to those of other G.M. divisions. Buick, Oldsmobile and Pontiac now have cast iron camshafts. With Ford and Chrysler using cast camshafts, only a few companies are retaining forged shafts. Cast crankshafts, on the other hand, appear to be making little headway.

Ford has abandoned chrome vanadium for nickel molybdenum steel for its rear axle drive pinion. Chrysler is extending specifications for Amola steel, including hypoid gears, to the point where over 400 lb. is required per car.

Chrome plating benefits from the return to greater ornamentation. More stainless steel is being consumed for trimmings; much of it is straight chrome although a small nickel content is sometmies used.

Overdrives and hypoid gears have been a boon to the nickel people, because nickel alloy steels are employed.

The shift of Fisher Body to all-steel bodies, except on a few high-priced General Motors cars, has meant about double the amount of welding compared with that on '36 models. The 1936 cars, in turn, had three or four

times as much welding on them as the '35 cars.

Momentarily equipment builders are occupied with getting machinery into autimotive plants rather than with new tooling programs, which won't "break" for 60 days or longer. Surface broaching promises to gain new adherents the coming year, with other companies following Packard's practice of broaching the entire surface of cylinder blocks.

Transmission Changes

With Oldsmobile due to offer an automatic transmission as optional equipment next spring, it is probable that considerable attention will be paid to transmission changes for 1938. If so, machine tool builders should benefit.

General Motors has spent $125,000,000 for plant expansion, modernization of existing factories and in tooling in preparation for 1937. Incidentally Detroit won't be surprised to see the corporation pay a healthy Christmas bonus to its workers this year as it did in '35.

Enlargement of G.M.'s eastern operations at Baltimore, Linden and Tarrytown will throw more raw materials and parts manufacturing business to eastern suppliers. Thus contributing to further decentralization and elimination of production bottlenecks which union labor might stop up in case of a strike.

The new Ford V-8 will be powered either with 85 horsepower as now or a 60 horsepower economy engine. The new car will resemble the Lincoln Zephyr, and will be priced below any previous Ford V-8. They will have all-steel bodies including steel tops and new braking systems which will be activated through a cable and will have controlled self-energizing action.

Industrial Review

• ALTHOUGH the distractions of the political campaign seem to have had little effect on orders for machinery and machine tools, there is a general feeling among distributors that future business will be better if the new deal is repudiated in today's election than if it is supported. Reports from leading industrial centers indicate that orders are still coming in satisfactorily but that long deliveries are becoming more and more of a handicap. Labor troubles are of no particular importance except for the marine strike.

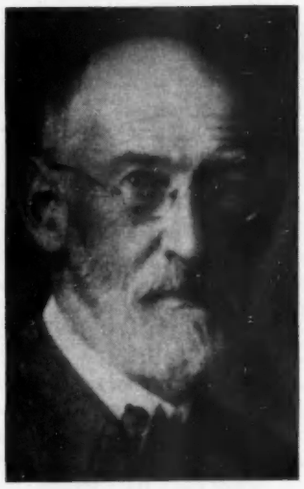
• NEW ENGLAND reports a satisfactory machinery business with prospects good. New York distributors say that the high level of recent months is being maintained. Philadelphia reports very little change. Orders are off in Pittsburgh territory but inquiries continue high.

• CLEVELAND agencies look for an improvement in business after the election no matter who wins. Business is still good in that region. Detroit dealers are experiencing the usual lull that accompanies the introduction of new automobile models but are looking forward to a big improvement within a few weeks when the public votes its acceptance of the new models by placing orders. In Toledo it is observed that the election seems to be having less effect in delaying the placing of orders than experience would lead one to expect.

• A TEMPORARY lull seems to have affected business in the Cincinnati territory to some extent but several of the machine tool builders there are more worried about getting out existing orders than booking new ones. Indianapolis does not expect the election to have any particular effect on business one way or the other. Both inquiries and orders are in fair volume. Prospects are good in St. Louis although orders are off a little. Railroad inquiry is the strongest for a long time. Business has been good in Chicago during the past month and there is every reason to expect it to be better. In Milwaukee the situation is not quite so good as in Chicago but it is still relatively satisfactory.

• STRIKE of 37,000 Pacific coast maritime workers Oct. 30 has halted shipping, is causing all industry to mark time, and has directly affected metal trades through machine tool orders for many coast shipyards being held up. Despite adversities, and regardless of the election's outcome, business continues well ahead of last year and the coast metal trades look forward to further increases. Recent machine tool sales in southern California have slumped, but early revival is expected.

Celebrates 75th Birthday



WILLIAM A. VIALL

On Monday, Oct. 26, WILLIAM A. VIALL, vice-president, Brown & Sharpe Mfg. Co., Providence, R. I., celebrated his 75th birthday anniversary quietly. Mr. Viall's many years with the company have seen the formation of numerous friendships that have stood the test of time. Always a supporter of sound and ethical business practices, Mr. Viall holds a unique position as advisor to younger men in the machine tool industry who look to his judgment with respect.

HEADS CANADIAN NATIONAL

S. J. HUNGERFORD, who began his railroad career as a machinist's apprentice on the Baltimore & Ohio, has been appointed chairman and president of the Canadian National Railways, the largest railroad system in North America, by the Canadian government. He held a number of mechanical executive positions both in the United States and Canada.

Watching Washington

Business looks to post-election activity . . . Obsolete equipment may affect industrial indexes . . . Military demands spur foreign orders . . . Jesse Jones advocates tax revision

WASHINGTON—Election over, industry can settle down to its real job of turning out products that keep the wheels of the nation turning—even the wheels of government. For upon industry rests the responsibility of converting the country's natural resources into usable wealth for its citizens to enjoy.

Fortunately the campaign was conducted with a minimum of disruption to business. The traditional election year lapses were of such small magnitude that they could be classed as deterrents to a cyclical upswing rather than real set backs. Business prognosticators for the most part predict resumption of an upward trend.

An underlying cause for this opinion is the fact that, despite increased outlays for new equipment, American industry is still burdened with obsolete machinery. So many inefficient units are being kept in service that revision of theoretical capacity for statistical purposes is being considered by government agencies. Federal statisticians would not be surprised to learn, for instance, that the steel industry is operating at present close to 90 per cent of its capacity. They doubt that the industry as equipped at present is capable of increasing its output by 25 or 30 per cent. Incidentally steel mills are employing more men than in 1929.

In other industries, too, some believe a wrong picture of rate of operation is being given. If these views are correct many plants must make provision for increased capacity if they are to meet demand.

Another underlying cause for faith in a rising industrial activity is the extent of foreign buying, stimulated in part at least by military preparations. An example is the reported purpose of the British Government to acquire American fighting planes. Whether the quantity be 300, 700 or 1,500, depending upon which unofficial report is correct, U. S. aircraft builders, machine and other allied industries will welcome the orders.

That Britain's machine capacity is hard pressed is good reason to give credence to this report. Probably nothing will happen to prevent American manufacturers from accepting the orders. This country can sell any other country all the munitions that it wants and can pay for. Only when a country starts fighting do suppliers here have to stop selling, provided, however, that the manufacturer (1) is duly licensed—fee $500—by the Munitions Control Board, and (2) that the manufacturer does not give away any military or naval secrets.

Of course, the President, as commander-in-chief of the Army and Navy, could, if he would, find "secrecy" reasons for stopping shipments. To the reminder that no U. S. military aircraft went to Spain (it is lately reported that several did, however) authorities say (1) that an understanding existed between manufacturers and the State Department; (2) that there was no Spanish money on the line, anyway; and (3) they expected their war to be over before airplanes could be built and delivered.

Whatever we sell England will not be first line equipment, from our point of view, because our spearhead machines carry military and naval secrets that cannot be released.

Consensus of opinion gives Glen L. Martin Co., of Baltimore, first place in line for orders, because this concern has least recent equipment in the U. S. service. Boeing Aircraft Co. of Seattle, Consolidated Aircraft Corporation of San Diego, and Curtis Aeroplane and Motor Co., are mentioned for second position.

One cloud on the business horizon is the new tax law. No one is in better position to observe its operation than R.F.C.'s Jesse Jones since his dealings have been largely with companies in a difficult financial position. From his front seat he can see what is happening to these debt-burdened concerns, and he faces possible losses on R.F.C. loans.

When the tax bill was under consideration, Mr. Jones urged the Senate Finance Committee to make substantial concessions that would encourage modernization, new plant construction and new buildings to replace old ones, new equipment for railroads and industry of all kinds, including allowances for new debts to be created for these purposes. If expenditures for these projects could be exempted from taxation in substantial part, he pointed out, "the taxpayer would be encouraged to improve plant and equipment, thus stimulating the movement of capital goods and the employment of labor."

Suggestions Were Disregarded

The committee disregarded Mr. Jones' suggestions at the time. In a radio speech, October 13, he not only renewed his plea; but indicated that such changes in the tax law would have the approval of the President. Those who know Jesse Jones are certain he would not have gone out on that limb had he not definite assurances to this effect.

In the course of his October 13 remarks, Mr. Jones advocated amendments to the tax bill that would encourage "modernization of all character . . . rebuilding . . . capital expenditures." Special emphasis he placed on the need for protection of "institutions laboring under debt." He recommended the law be amended so that concerns in debt would pay only normal taxes until their indebtedness is liquidated. He also advocated a change in the statute to allow an enterprise to accumulate reasonable reserves to carry it "through periods of depression of slack business."

The Senate was inclined to that point of view when the law was under consideration, but the House was demanding a much more drastic levy on undistributed earnings. In order to get through any change whatsoever the Senate had to be content with what it would get.

The situation in January probably will be greatly changed. The Senate will be more opposed to the tax bill than ever. Loss of Democratic strength in the House will probably make possible changes along the line indicated by Chairman Jones.

Nash Motors, Kelvinator Directors Vote Merger

C. W. Nash to Be Chairman of Combined Interests; G. W. Mason to Be President

Merger of the Nash Motors Co. and the Kelvinator Corp. into a new concern to be known as the Nash-Kelvinator Corp., with Charles W. Nash as chairman and George W. Mason, head of Kelvinator, as president, was approved Oct. 27 by the directors of the two companies. The consolidation is one of the most important since the wave of corporate mergers of the late 1920's.

Under the terms of the agreement, which will be submitted to shareholders, the present owners of Nash stock will have a 62½ per cent interest in the new corporation, the balance going to the present holders of Kelvinator.

To effect the merger, it was announced, the authorized capital stock of the Nash Motors Company will be increased so that 1⅜ shares may be issued for each share of Kelvinator.

The companies will carry on their present businesses without interruption. The deal involves no transfer of the present manufacturing facilities of either concern.

The Nash company is one of the pioneer automobile manufacturing companies. It was founded in 1916 by Mr. Nash, the present chairman, as successor to the old Jeffery company.

Machine Authority Dies

JAMES A. HALL

JAMES A. HALL, 48, professor of mechanical engineering at Brown University, Providence, R. I., died from a brain tumor, Oct. 29, at the Jane Brown Hospital here after a week's illness. Professor Hall, a member of the engineering staff since 1914, was an authority on machine design.

He was graduated from Brown in 1908 and received his Sc. B. in mechanical engineering in 1910.

Professor Hall was a former president of the Providence Engineering Society, a member of the Society for the Promotion of Engineering Education and chairman of the New England division and a member of the Council of the American Society of Mechanical Engineers.

Republic Steel Plans $30,000,000 Expansion

New Wide Continuous Strip Mill Included in Program

Republic Steel Corp., Cleveland, has announced plants to spenl $30,000,000 for improvements, including construction of a new wide continuous strip mill. Coke ovens, enlarging existing blast furnaces and new machinery to step up output are included in the plans.

A. S. M. E. Announces Awards

The American Society of Mechanical Engineers Board of Honors and Awards announces the following honors to be conferred at the 1936 Annual Meeting, Nov. 30 to Dec. 3, in N. Y.

Holley Medal to HENRY FORD, Ford Motor Co., Dearborn, Mich.

A.S.M.E. Medal to EDWARD BAUSCH, Bausch & Lomb Optical Co., Rochester, N. Y.

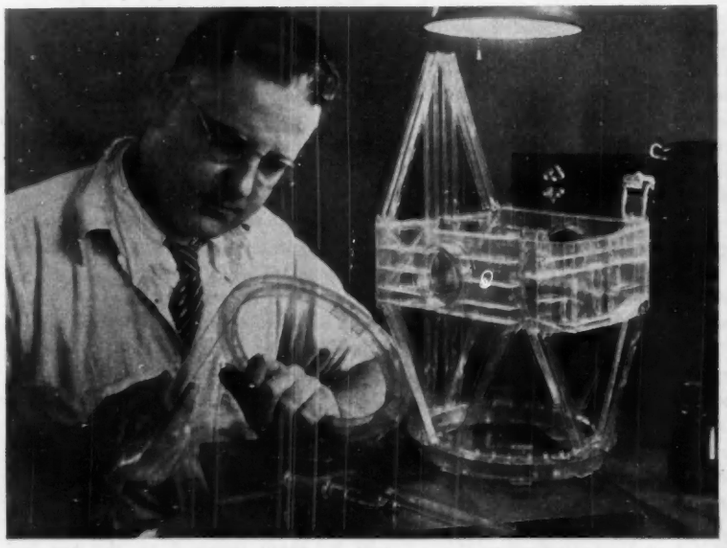
Worcester Reed Warner Medal to CHARLES M. ALLEN, professor of mechanical engineering, Worcester Polytechnic Institute, Worcester, Mass.

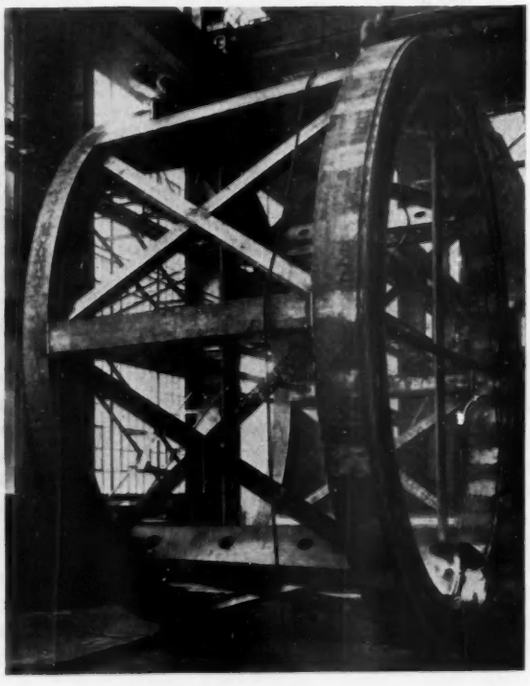
Melville Medal to H. A. S. HORWARTH, Kingsbury Machine Works, Philadelphia.

Junior Award to HARWOOD F. MULLIKIN, JR., Babcock & Wilcox Co., N. Y.

Undergraduate Student Award to LEON B. STINSON, Oklahoma Agricultural and Mechanical College.

Postgraduate Student Award to DEWITT D. BARLOW, JR., Princeton University.





Instrument maker, above—at work on the Westinghouse 1/32 scale model of the 200-in. telescope for the California Institute of Technology, to be installed in its Mt. Palomar, Calif., observatory. *Right*—Electrically welding the huge prime focus ring in the Westinghouse Electric & Mfg. Co., South Philadelphia works

Engineering Curricula Accredited By Council

New England and Middle Atlantic Colleges are Studied

Formal action in accrediting engineering curricula in educational institutions in New England and Middle Atlantic states by the Engineers' Council for Professional Development was announced recently by H. H. Henline, secretary of the Council.

The Engineers' Council for Professional Development comprises engineering bodies organized to enhance the professional status of the engineer through the cooperative support of the national organizations directly representing the professional, technical, educational, and legislative phases of the engineer's life. The participating bodies are the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Institute of Chemical Engineers, Society for the Promotion of Engineering Education and National Council of State Boards of Engineering Examiners.

The engineering curricula accredited by the Council are only those offered in educational institutions in the New England and Middle Atlantic states, because the Committee on Engineering Schools, which acts for the Council in making the investigations and reports on which the accrediting is based, has so far confined its work to these two areas. Hence the lists accredited curricula are a progress report which will be supplemented when the Council has had an opportunity to extend its investigations to institutions in other parts of the country.

Only undergraduate curricula leading to degrees were considered at this time. Curricula, not institutions, were to be accredited and both qualitative and quantitative criteria were set up as a basis for final action.

Qualitative criteria were evaluated through the inspection committee and included the following:

1. Qualifications, experience, intellectual interests, attainments and professional productivity of members of the faculty.
2. Standards and quality of instruction.
   a. In the engineering departments.
   b. In the scientific and other cooperating departments in which engineering students receive instruction.
3. Scholastic work of students.
4. Records of graduates both in graduate study and in practice.
5. Attitude and policy of administration toward its engineering division and toward teaching, research and schorlarly production.

Quantitative criteria were evaluated through the following data secured from catalogs and other publications and from questionnaires:

1. Auspices, control and organization of the institution and of the engineering division.
2. Curricula offered and degrees conferred.
3. Age of the institution and of the individual curriculum.
4. Basis of and requirements for admission of students.
5. Number of students enrolled.
   a. In the engineering college or division as a whole.
   b. In the individual curriculum.
6. Graduation requirements.
7. Teaching staff and teaching loads.
8. Physical facilities. The educational plant devoted to engineering education.
9. Finances: investments, expenditures, sources of income.

The list of accredited mechanical engineering curricula follows: are:

Brown University
Carnegie Institute of Technology
Clarkson College of Technology
Columbia University
Cooper Union Institute of Technology
Cornell University
University of Delaware
Drexel Institute
Johns Hopkins University
Lafayette College
University of Maine
Massachusetts Institute of Technology
University of New Hampshire
New York University
Newark College of Engineering
Pennsylvania State College
University of Pittsburgh
Polytechnic Institute of Brooklyn
Princeton University
Rensselaer Polytechnic Institute
Rhode Island State College
University of Rochester
Rutgers University
Swarthmore College
Syracuse University
Tufts College
University of Vermont
Worcester Polytechnic Institute
Yale University

NEW TOOL COMPANY FORMED IN DETROIT

Partool Machine Co. has been organized at Detroit, with capital of $100,000, to manufacture special machine tools and to do jobbing work. It soon will build a plant which is expected to be ready for operation by Feb. 1. Officers are Charles E. French, president; O. A. Montgomery, secretary and treasurer; and Max Clark, general manager. The Sterling French Machinery Co., New Center Building, Detroit, will be sales agents.

PANAMA ACETYLENE PLANT

The Panama Administration will build an oxy-acetylene plant for high pressure gas. About $160,000 will be spent.

British Metal Industries Report Gains Unabated

Wide Range of Activities Are Showing Substantial Gains

British trade reports continue highly encouraging. The activity of the capital-goods industries is unabated. The demand for coal, mainly from heavy industries, is counteracted by the loss of the Italian and Spanish markets. The iron, steel and machinery industries are operating at capacity and are speeding completion of new equipment.

All British machine tool firms are full up with orders and some are quoting 50 and 60 weeks' delivery, *American Machinist* was told. British imports of American machine tools during the first nine months of this year reached £1,375,502, as compared with £2,380,079 from all countries. Germany exported £665,923 worth to Britain during this period.

Shipbuilding is sharing in the improvement, unemployment in this industry being appreciably smaller than it was last year. Railway freight receipts, electricity production and building plans compare very favorably with last year, although the construction industry now is evidently past its peak.

The keel of No. 552, sister ship of the *Queen Mary*, will be laid soon in John Brown & Co. Clydebank shipyard. By next summer, it is expected that 5,000 men will be employed at the shipyard alone.

Private Arms Industry Essential, Officer Says

Federal Supervision Only Is Needed In Event of War

In the opinion of Captain W. D. Puleston, United States Navy, this country must look to private industry for its munitions in the event of future war. In an article published in the current issue of *Army Ordnance*, the journal of the Army Ordnance Association, Captain Puleston says: "A sound munitions and shipbuilding industry is as essential to a modern state as its army and navy."

Any supervision necessary, he declares, should be exercised by a war industries board, controlling factories, mines and plants.

The government, to "insure that no capital is allowed to work in an unessential industry," would also regulate industrial capital through a war finance board, he says. Through use of an excess-profits tax, he declares, profit could be taken out of war.

Japanese Tool Plants Gear Up Production

Sharp Demand for Machinery Noted As Industrial Output Gains

Recent exclusive reports to *American Machinist* indicate increased volume of inquiries and buying of machine tools and manufacturing equipment as the winter season approaches. With a gain in American machinery imports registered during the first half of 1936, domestic manufacturers of tools have announced expansion programs. Among these are Shinohara Machinery Works, Japan Machine Tool Works, Wanishi Iron Works, Hirao Works and Tokyo Gasundenki, with an estimated total of more than $1,000,000, at the current rate of exchange at 28.6 cents per yen, to cope with the demand.

So acute is the shortage that many machinery builders are rebuilding old machinery at an unprecedented rate because of the unfavorable yen exchange rate. Recently the Naval Arsenal at Hiro met with leading Japanese machinery manufacturers to discuss a wide modernization program for tool builders.

Nissan Automobile Co. will spend more than $1,400,000 for new machinery; Ebara Works, Tokyo tractor manufacturer, has appropriated $250,000 for new equipment; Matsushita Electric Apparatus Industry Co., Osaka, will expand into electric motor manufacturing requiring a large list of new machinery and Toyoda Automobile, Osaka Chain Mfg. Co., Kotabuki Airplane Works, Hiroshima Toyo Industry, Fuji Nagata Dockyard and Sasebo Naval Arsenal requirements are making inquiries and buying new tools.

On Sept. 29 Furukawabshi Industrial Machinery Hall at Azaby, Tokyo, opened with 60 exhibits of precision manufacturing machines, and a conference was held in Osaka for a machine tool show there in March, 1937.

Ikegai and Karatsu Works are making advances in the bench tool field to supply the Japanese markets.

During the first half of the year Russia exported $1,348,650 worth of machinery to Japan, but imported more than $4,000,000 worth.

Outboard Engine Makers to Merge

Johnson and Outboard Become Outboard Marine & Mfg. Co.

Stockholders have voted to consolidate the Johnson Motor Co. and Outboard Motors Corp. to form a new company to be known as Outboard, Marine & Mfg. Co. The board of directors of each company agreed, subject to the approval of the stockholders, on the consolidation. Directors of both companies express their belief that the consolidation will make possible worthwhile savings.

Air Conditioning Equipment Shows Marked Increases

Orders Will Nearly Double 1935 Total by End of Year

Air conditioning equipment manufacturers have booked $28,156,000 worth of orders during the first eight months of this year, as compared with $17,261,000 for the twelve months of 1935, Lewis M. Lind, acting chief, machinery division, Bureau of Foreign and Domestic Commerce, reports. For the full year of 1934 about $13,000,000 orders were reported.

Exports for the first eight months of 1936 are estimated at $583,000, as compared with $320,500 for the entire year of 1934. Comparable 1935 data are not obtainable.

Interesting applications abroad are reported, including atmospheric conditioning in Ceylon tea factories and improving ventilation in African gold and diamond mines.

HEADS FOUNDATION

FRANK MALCOLM FARMER, vice-president and chief engineer of the Electrical Testing Laboratories, New York, has been elected chairman of the Engineering Foundation, research organization of the national engineering societies. An authority on electrical measurements, electrical insulating materials, testing of engineering materials, and high voltage cables, he succeeds H. P. Charlesworth, assistant chief engineer of the American Telephone and Telegraph Co.

Mr. Farmer is past president of the American Society for Testing Materials and of the American Welding Society. He is vice-chairman of the Standards Council, American Standards Association.

D. ROBERT YARNALL of the Yarnall-Waring Co., Philadelphia, was re-elected vice-chairman of the Foundation. Dr. Alfred D. Flinn continues as director and secretary.

Elected to the executive committee were OTIS E. HOVEY, 71 Broadway, New York; A. L. J. QUENEAU, metallurgist of the United States Steel Corp., New York, and PROF. WALTER I. SLICHTER, Columbia University.

Dr. Thomas Named S. A. E. Banquet Speaker Nov. 12

W. L. Batt Will Preside as Toastmaster for Engineers

JAMES S. THOMAS, president, Clarkson College of Technology, Potsdam, N. Y., will be the speaker at the annual dinner of the Society of Automotive Engineers, Inc., Nov. 12, at Hotel Commodore, New York, JOHN A. C. WARNER, general manager, announced. WILLIAM L. BATT, president of SKF Industries, Philadelphia, and for several years chairman of the Society's finance committee, will be toastmaster. Mr. Batt is also president of the American Society of Mechanical Engineers. Dr. Thomas will speak on "What the Machine Has Done to Mankind."

BUSINESS ITEMS

American Hoist & Derrick Co., St. Paul, has appointed S. M. Hunter, formerly sales manager of Novo Engine Co., to its sales department.

Bonney Forge & Tool Works, Allentown, Pa., has appointed H. H. Cleveland, recently sales manager of Billings & Spencer Co., Hartford, Conn., to its sales staff.

Cleveland Duplex Machinery Co. has appointed William B. Terbeek, formerly general factory superintendent, Great Lakes Aircraft Corp., Cleveland, to its sales staff.

Davis Boring Tool Co., 6200 Maple Ave., St. Louis, has appointed Machinery Tool & Sales Co., Detroit, its representative in that territory.

Detroit Broach Co., 6000 Beniteau Ave., Detroit, has appointed F. G. Jackson direct representative in the Chicago territory, with offices at 400 West Madison Ave.

Easton Car & Construction Co., Easton, Pa., has named H. B. Fuller Equipment Co., Cleveland, agents in that area. The company manufactures material handling equipment, including the Lakewood line.

Productive Equipment Corp., Chicago, has appointed the Canadian Locomotive Co., Kingston, Ont., to manufacture and sell "Selecto" vibrating screens in Canada.

Searns Magnetic Mfg. Co., Milwaukee, has appointed H. W. Hartman sales engineer.

Upson division, Republic Steel Co., Cleveland, has appointed Frank P. McEwan assistant manager of sales.

New Electro-Motive Executive

FRANK H. PRESCOTT

FRANK H. PRESCOTT, formerly general manager, Delco Products division, General Motors Corp., has been elected a vice-president and named general manager of Electro-Motive Corp., LaGrange, Ill., railroad diesel locomotive manufacturer, H. L. MAMILTON, president, announced.

PERSONALS

W. E. BLEWETT, JR., formerly assistant to the president, has been appointed production manager of Newport News Shipbuilding & Dry Dock Co., Newport News, Va.

EDWARD T. CAUSER, formerly manager of the crankshaft division, Union Drawn Steel Co., Beaver Falls, Pa., has been appointed works manager of Berger Mfg. Co., Canton, Ohio, another subsidiary of Republic Steel Corp. At one time he was in charge of manufacturing of Nordyke-Marmon Co., Indianapolis, and had been chief manufacturing executive of the Chandler Motor Co., Cleveland. A. C. BELLES succeeds him at Beaver Falls.

C. J. FECHEIMER has been appointed consulting engineer of Louis Allis, Inc., Milwaukee, Wis. He was recently appointed director of the college, Milwaukee School of Engineering.

WILLIAM GATEWOOD, for a number of years works manager of Newport News Shipbuilding & Dry Dock Co., Newport News, Va., has been elected vice-president.

F. A. HURCOMB, formerly vice-president of Federal Machine & Welding Co., Warren, Ohio, has been made general manager in charge of production, Edwards Iron Works, South Bend, Ind., automotive body, parts and trailer manufacturer.

CHARLES F. KETTERING, president, General Motors Research Corp., Detroit, has been appointed chairman of a nation-wide celebration of the establishing of the U. S. patent system 100 years ago. Nov. 23 has been set for the commemoration, with a ceremony at Washington, D. C.

ROY A. KROPP has been elected president of Kropp Forge Co., Chicago, succeeding CHARLES A. KROPP, now chairman of the board. The new president's entire business career has been devoted to modernizing production methods for drop and hammer forgings.

FRANK LEITZELL has been elected vice-president in charge of sales of Lewis Foundry & Machine Co., Groveton, Pa. WILLIAM CORDES SNYDER, JR., has been elected vice-president in charge of roll sales.

ADRIAN MARMOR, who has been connected with the Autocar Co., Ardmore, Pa., for several years as designer, is now with the Hale Fire Pump Co., Inc., Conshohocken, Pa., as superintendent in charge of design manufacture of fire apparatus.

Bantam Automotive Head

Bagby photo.

S. R. THOMAS

S. R. THOMAS, for the past four years associated with Cord Corp., and lately chief engineer of Cord, Auburn and Dusenberg automobile companies, has been appointed manager of the automotive bearing division of Bantam Ball Bearing Co., South Bend, Ind. Previously he had been with General Motors Corp.

Delco General Manager

C. H. KINDL

C. H. KINDL, factory manager, Delco Products division, General Motors Corp., Dayton, Ohio, has been appointed general manager succeeding Frank H. Prescott. In 1929 he was appointed chief engineer, and last January was made factory manager of the Delco plant.

H. L. NANCARROW, formerly master mechanic, Philadelphia Terminal division, Pennsylvania Railroad Co., has been named superintendent of the Logansport division. He is succeeded by C. O. SHULL, former master mechanic, Chicago Terminal, who in turn is succeeded by W. R. DAVIS, formerly assistant master mechanic, Philadelphia division.

THOR M. OLSON has been named sales manager of the Ex-Cell-O Aircraft & Tool Corp., Detroit. He was general manager of the Continental Tool Works, Detroit, from its establishment until shortly after it was acquired by Ex-Cell-O in 1930. After becoming associated with Ex-Cell-O, he became vice-president and a member of the board of directors.

GEORGE POCKELS, vice-president, Clearing Machine Corp., Chicago, has sailed for Europe on a business trip. The company enjoys a large export market for its line of presses in England and on the Continent.

J. Y. SCOTT, formerly vice-president, has been elected executive vice-president of Van Norman Machine Tool Co., Springfield, Mass. L. F. HUNDURUP, formerly general sales manager, was named assistant general manager. R. W. PORTE, formerly cashier and credit manager, is now assistant treasurer, and T. W. BAUSH, formerly assistant sales manager, was appointed export manager and man-

ager of the sales department of the Van Norman company.

JOSEPH T. SOMERS, formerly vice-president, has been elected president of Wyckoff Drawn Steel Co., Pittsburgh, succeeding the late A. W. WYKOFF, founder of the company. Mr. Sommers has been active in the management of the company since it was founded.

STANWOOD W. SPARROW has been named research engineer of the Studebaker Corp., South Bend, Ind., succeeding W. S. JAMES who recently became chief engineer. Mr. Sparrow has been a member of the Studebaker engineering staff for several years and was formerly with the National Bureau of Standards.

PROF. ELIHU THOMSON, inventor of resistance welding and a pioneer in electrical development, was honored Oct. 16 by the Detroit section, American Welding Society, with a program dedicated to the 50th anniversary of his epochal invention. He was a founder of General Electric Co.

J. B. WOODWARD, JR., has been appointed general manager of Newport News Shipbuilding & Dry Dock Co., Newport News, Va. He worked in the shops of the Peerless Motor Car Co., Cleveland, upon his graduation from Massachusetts Institute of Technology, and later taught mathematics in the University of Richmond. For the past seven years he has been assistant general manager of the company.

HARRY WILSON has been appointed works manager, a new post, of Jessop Steel Co., Washington, Pa.

EDWARD F. ZEHNDER, for 22 years manager of the Eastern Malleable Iron Co., has been appointed general manager of the Pequonnock Foundry, Inc., Bridgeport, Conn., founders and machinery manufacturers. The company announces purchase of additional equipment to broaden its lines of products.

OBITUARIES

SENATOR JAMES COUZENS, 64, who with C. Harold Wills was one of Henry Fords earliest manufacturing associates, died Oct. 22 following an operation. A native of Canada, he joined the small Ford group as one of the incorporators of the company in 1903, and was bought out in 1916 for nearly $30,000,000 although he remained as a director until 1919. He then devoted his time to civic work, was elected mayor of Detroit in 1922, and served a short term in the U. S. Senate and was reelected in 1924 and 1930. During the recent primary he lost the nomination to his opponent. His philanthropies were numerous and generous.

DAVID W. CLARK, 68, managing director of Anglo-Canadian Wire Rope Co., which with the Atlas Metal and Alloy Co. of Canada, Ltd., he founded, died Sept. 23.

F. D. KENNEDY, 66, an authority on manufacturing railroad and locomotive power equipment and an executive of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., died Sept. 28. He joined the company in 1893.

WILLIAM ROBERTSON, 73, founder and president of W. Robertson Machine & Foundry Co., Buffalo, died Sept. 26. He was one of the pioneers of the hack saw industry.

G. LEWIS WALTERS, 62, vice-president, secretary and treasurer of Adams & Westlake Co., Chicago, railroad equipment and supply manufacturers, died Oct. 1.

MEETINGS

AMERICAN MANAGEMENT ASSOCIATION. Tax and Financial Problems conference. Dec. 2-4, Waldorf-Astoria Hotel, New York. Alvin E. Dodd, president, 330 West 42nd St., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual Meeting, Nov. 30-Dec. 4, Engineering Societies Bldg., New York. C. E. Davies, secretary, 29 West 39th St., New York.

AUTOMOBILE SHOW, NATIONAL. Nov. 11-18. Grand Central Palace, New York. Alfred Reeves, general manager, 366 Madison Ave., New York.

INTERNATIONAL ACETYLENE ASSOCIATION, 37th Annual Convention, Nov. 18-20, St. Louis.

MARINE EXHIBITION, Third Annual. Nov. 12-20, Maritime Bldg., New York. A. R. Risso, chairman, 80 Broad St., New York.

PACKAGING MACHINERY MANUFACTURERS INSTITUTE. Annual Convention, Nov. 11 and 12, Edgewater Beach Hotel, Chicago. H. L. Stratton, secretary, 342 Madison Ave., New York.

TWELFTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, Nov. 30-Dec. 5, Grand Central Palace, New York, Charles F. Roth, manager.

EXPORT OPPORTUNITIES

Automobile service tools and machinery. (Agency.) Antwerp, Belgium. *1773.

Hardware and small tools. (Agency.) Karachi, India. *1744.

Milk bottle cardboard cap making machinery. (Purchase.) Coldbrook, Canada. *1747.

Grinders for tobacco stems. (Purchase.) Bayamon, Puerto Rico. *1749.

Machines and machine tools for automobile, abrasives, pottery, leather, foundry and steel plants. (Agency.) London, England. *1751.

Oil expellers. (Agency.) Brussels, Belgium. *1769.

Paper making machinery. (Purchase.) Iquique, Chile. *1770.

Saw mill machinery, portable. (Purchase.) Retreat, South Africa. *1777.

Automobile service station machinery and tools. (Agency.) Buenos Aires, Argentina. *1728.

Punches for sheet steel manufacture. (Purchase.) St. Die, France. *1711.

Biscuit making machinery and equipment. (Purchase.) Singapore, Straits Settlements. *1731.

Crane, 120 ton, titan. (Purchase.) Rabat, Morocco. *1718.

Metal-testing instruments. (Purchase.) Warsaw, Poland. *1653.

Stone grinding and surfacing machinery. (Purchase.) Airdrie, Scotland. *1681.

Bottling, corking and filling equipment, beverages. (Purchase.) Brussels, Belgium. *1656.

Concrete block manufacturing and materials handling equipment. (Purchase.) Airdrei, Scotland. *1681.

Lamp bulb and radio tube manufacturing machinery. (Agency.) London, England. *1658.

Road-building machinery. (Agency.) Bogota, Colombia. *1665.

Sugar-beet mill equipment. (Purchase.) Guerrero, Mexico. *1680.

Machinery for manufacturing aluminum sheets, tubes and shapes. (Purchase. Prague, Czecholovakia. *1639.

*Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, or any district or cooperative office. Please refer to key number.

American Machinist
REFERENCE BOOK SHEET

90-Deg. Bends in Non-Ferrous Sheet Materials

Many parts are made from thin sheets of non-ferrous metals in a series of blanking, punching and forming operations. Such formed parts may vary in size from small springs made from sheet metal only 0.005 in. thick to large boxes made from 3/8-in. stock.

Formed parts which are bent over too sharp a radius may crack. This cracking results from stressing the outer fibers of the metal beyond the point of rupture during the forming operation. When the overstressing is less severe, an "orange peel" effect is produced. Such a condition, while not as objectionable as an open crack, is unsightly in finished apparatus, and because of the overstrained condition of the metal, early failure of the part may result through accidental overstressing in service or through corrosion. It is therefore desirable from a

Abstracted from a paper presented by G. R. Gohn, before the thirty-ninth annual meeting of the American Society for Testing Materials, July 1936.

Radii for Forming 90-deg. Bends in Miscellaneous Sheet Metals

Alloy	Temper, B. & S. Numbers Hard	B. & S. Gage	Rockwell Hardness, "G" Scale	Minimum Suitable Radius of Punch, in.		
				Bend Perpendicular to Direction of Rolling	Bend at 45 deg. to Direction of Rolling	Bend Parallel to Direction of Rolling
Clock brass	Hard 4 (68,000 to 78,000 lb. per sq. in)	No. 24	75 to 83	Sharp	1/32	1/32
	Spring 8 (85,000 to 94,500 lb. per sq. in.)	No. 24	85 to 89	1/16	5/32	>1/4
D brass	Hard 4	No. 24		1/32	3/64	7/32
	Spring 8	No. 24		1/32	3/32	7/32
E brass	Hard 4 (68,000 to 78,000 lb. per sq. in)	No. 14	75 to 83	3/64	3/64	1/16
	Spring 8	No. 24		1/16	5/32	1/4
Low brass	Hard 4	No. 24		1/32	3/64	1/16
	Spring 8	No. 24		1/32	1/8	3/16
A Phosphor bronze	Half hard 2 (55,000 to 70,000 lb. per sq. in.)	No. 24	15 to 51	Sharp	Sharp	Sharp
	Hard 4 (72,000 to 87,000 lb. per sq. in.)	No. 24	53 to 64	Sharp	1/32	1/16
	Spring 8 (91,000 to 105,000 lb. per sq. in.)	No. 24	67 to 73	1/64	3/32	3/16
D Phosphor bronze	Hard 4 (71,000 to 85,000 lb. per sq. in.)	No. 24		1/32	3/32	7/32
	Spring 8 (91,000 to 101,000 lb. per sq. in.)	No. 24		1/16	7/32	>1/4
Manganese brass	Hard 4	No. 24		Sharp	1/64	3/64
	Extra hard 6	No. 24		1/32	1/16	1/8
	Spring 8	No. 24		1/32	1/8	1/4
Copper silicon alloys[a]	Hard 4	No. 24		1/32	1/32	1/16
	Spring 8	No. 24		3/64	3/32	3/16
Copper	Half hard 2 (37,000 to 44,000 lb. per sq. in.)	No. 24	30 to 50	1/32	1/32	3/64
	Extra hard 6 (46,000 to 55,000 lb. per sq. in.)	No. 24	50 to 62	1/64	1/32	1/32
HEATED 1 HR. AT 800 C., QUENCHED IN WATER						
Beryllium-copper	Soft 0	No. 18		Sharp	Sharp	Sharp
	Half hard 2	No. 18		1/16	3/32	1/8
	Hard 4	No. 18		3/16	7/32	>1/4
Nickel-beryllium copper	Soft 0	No. 26		1/64	1/64	1/64
	Quarter hard 1	No. 26		1/32	1/32	1/32
		No. 18		3/32	1/16	1/8
	Half hard 2	No. 26		1/32	1/32	1/32
HEATED 1 HR. AT 800 C., QUENCHED IN WATER AND AGED AFTER ROLLING						
Monel metal	Quarter hard 1	No. 18		1/4	>1/4	>1/4
	Hard 5	No. 24		1/32	3/64	1/8
	Full hard 7	No. 24		1/32	3/64	5/32
Grade A nickel	Hard 4	No. 24		1/32	1/32	3/16
	Spring 8	No. 24		1/32	3/32	3/16
Inconel	Soft 0	No. 24		Sharp	Sharp	Sharp
	Hard 4	No. 24		Sharp	Sharp	Sharp

[a] Includes Everdur, Duronze and Herculoy.

Principal Chemical Composition Limits for Non-Ferrous Sheet Metals

Alloy	Copper, per cent	Lead, per cent	Iron, per cent	Zinc, per cent	Tin, per cent	Nickel, per cent	Other elements, per cent
Clock brass	61.00 to 64.00	1.25 to 2.00	0.06 max.	Remainder	—	—	—
Alloy D brass	73.00 to 76.00	0.25 max.	0.05 max.	Remainder	—	—	—
Alloy E brass	64.00 to 67.00	0.80 to 1.10	0.08 max.	Remainder	—	—	—
Low brass[a]	80.00	—	—	20.00	—	—	—
A phosphor bronze	94.40 min.	0.05 max.	0.10 max.	0.30 max.	3.80 to 4.80	—	0.05 to 0.35 phosphorus, 0.01 max. antimony
D phosphor bronze	90.0 min.	2.50 to 4.00	0.10 max.	0.20 max.	4.50 to 5.50	—	0.05 to 0.25 phosphorus
Manganese brass	63.00 to 66.00	0.10 max.	0.10 max.	Remainder	—	—	0.75 to 1.25 manganese
Everdur[a]	96.0	—	—	—	—	—	3.0 silicon, 1.0 manganese
Duronze[a]	97.0	—	—	—	2.0	—	1.0 silicon
Herculoy[a]	95.25	—	—	1.0	0.5	—	3.25 silicon
Copper	99.90 min.	—	—	—	—	—	—
Beryllium-copper[a]	Remainder	—	—	—	—	—	2.25 beryllium
Nickel-beryllium-copper[a]	Remainder	—	—	—	—	0.5	2.50 beryllium
Monel metal	26.0 to 30.0	—	3.0 max.	—	—	65.0 to 70.0	0.25 max. carbon, 0.25 max. phosphorus, 0.25 max. silicon, 1.5 max. manganese
A nickel	0.25 max.	—	0.5 max.	—	—	99.0 min. (plus cobalt)	0.15 max. carbon, 0.10 max. phosphorus, 0.35 max. manganese, 0.02 max. sulfur
Inconel[a]	—	—	6.0	—	—	80.0	14.0 max. chromium

[a] Nominal composition.

90-Deg. Bends in Non-Ferrous Sheet Materials

design and manufacturing standpoint to have available data relative to the forming properties of the different thicknesses and tempers of the various sheet metals used.

The method for determining the minimum safe forming radius for a given material formed over 90-deg. V punches consists in taking specimens approximately ¾ by 8 in. cut from a sheet of metal parallel, at 45 deg., and at 90 deg. to the direction of rolling. These specimens are then formed over each of a series of punches having various radii until a satisfactory forming radius is obtained. The punches used had sharp radii of 1/64, 1/32, 3/64, 1/16, 3/32, 1/8, 1/4, 3/8, 1/2, 3/4 and 1 in.

In use, the distance between the punch and the die at the end of the downward stroke is adjusted to the approximate thickness of the material under investigation. The specimen is then placed unclamped on a die having a sharp 90-deg. V groove and the specimen formed in the usual manner on a punch press. The press used had a capacity of 25 tons near the bottom of the stroke, a stroke of 1½ in. and a speed of 120 r.p.m.

If these specimens were cracked or had a pronounced "orange peel" effect, that radius was considered unsatisfactory. Successively large radii were used until specimens were obtained which showed no cracking or pronounced "orange peel."

Radii for Forming 90-deg. Bends in Alloy A Nickel Silver Sheet

N.D. = Not determined. Tensile strength limits are given in parentheses.

Temper, B. & S. Numbers Hard	B. & S. Gage	Minimum Suitable Radius of Punch, in.		
		Bend Perpendicular to Direction of Rolling	Bend at 45 deg. to Direction of Rolling	Bend Parallel to Direction of Rolling
Half hard 2 (65,500 to 73,500 lb. per sq. in.)	Nos. 36 to 19 incl.	Sharp	Sharp	Sharp
	No. 18	N.D.	1/64	1/32
	No. 16	Sharp	1/64	N.D.
	No. 14	N.D.	N.D.	3/32
	No. 11	3/32	3/32	1/8
Hard 4 (75,000 to 82,000 lb. per sq. in.)	Nos. 36 to 26 incl.	Sharp	Sharp	Sharp
	No. 24	Sharp	Sharp	1/64
	No. 22	Sharp	Sharp	N.D.
	No. 20	1/16	1/16	1/16
	No. 16	1/16	1/16	3/32
Extra hard 6 (81,000 to 88,000 lb. per sq. in.)	Nos. 36 to 26 incl.	Sharp	Sharp	N.D.
	No. 22	1/64	1/32	N.D
	No. 20	1/8	1/8	1/8
	No. 18	1/8	1/8	3/16
	No. 16	5/32	5/32	7/32
Spring 8	Nos. 36 to 32 incl.	Sharp	Sharp	N.D.
	No. 30	Sharp	1/64	N.D.
	No. 26	1/64	1/64	N.D.
	No. 24	3/64	3/32	3/16
	No. 22	3/64	3/16	N.D.
	No. 18	5/32	3/16	7/32
	No. 16	5/32	7/32	N.D.
	No. 14	>1/4	>1/4[a]	>1/4
Extra spring 10	No. 36	Sharp[a]	Sharp	N.D.
	No. 34	Sharp	Sharp	N.D.
	No. 32	Sharp	1/64	N.D.
	No. 30	Sharp	1/64	N.D.
	No. 28	1/64	N.D.	N.D.
	No. 22	3/64	1/8	N.D.
	No. 20	5/32	7/32	N.D.
	No. 16	5/32	1/4	N.D.

[a] Interpolated from forming data on other pages.

Radii for Forming 90-deg. Bends in Alloy B Nickel Silver Sheets

Tensile strength limits are given in parentheses. Rockwell hardness values are limiting values corresponding to tensile strength limits.

Temper, B. & S. Numbers Hard	B. & S. Gage	Rockwell Hardness "G" Scale	Minimum Suitable Radius of Punch, in.		
			Bend Perpendicular to Direction of Rolling	Bend at 45 deg. to Direction of Rolling	Bend Parallel to Direction of Rolling
Half hard 2 (78,000 to 93,000 lb. per sq. in.)	Nos. 36 to 26 incl.		Sharp	Sharp	Sharp
	No. 24	48 to 67	Sharp	Sharp	Sharp
Hard 4 (92,000 to 106,500 lb. per sq. in.)	No. 24	66 to 75	1/32	1/32	3/32
Extra hard 6 (102,000 to 115,000 lb. per sq. in.)	No. 36		Sharp	Sharp	Sharp
	No. 34		Sharp	Sharp	Sharp
	No. 32		1/64	1/64	1/64
	No. 28	69 to 78	1/64	1/64	1/64
	No. 27	69 to 78	1/64	1/64	1/32
	No. 26	69 to 78	1/32	3/64	1/8
	No. 22	72 to 79	3/32	3/32	1/8
	No. 21	72 to 79	3/32	3/32	3/16
	No. 18	75 to 82	1/8	5/32	3/16
	No. 16	75 to 82	1/8	5/32	7/32
	No. 14	75 to 82	5/32	3/16	3/8
	No. 11	75 to 82	3/8	3/8	3/8
		75 to 82	>1/4	>1/4	>1/4

Ideas FROM PRACTICAL MEN

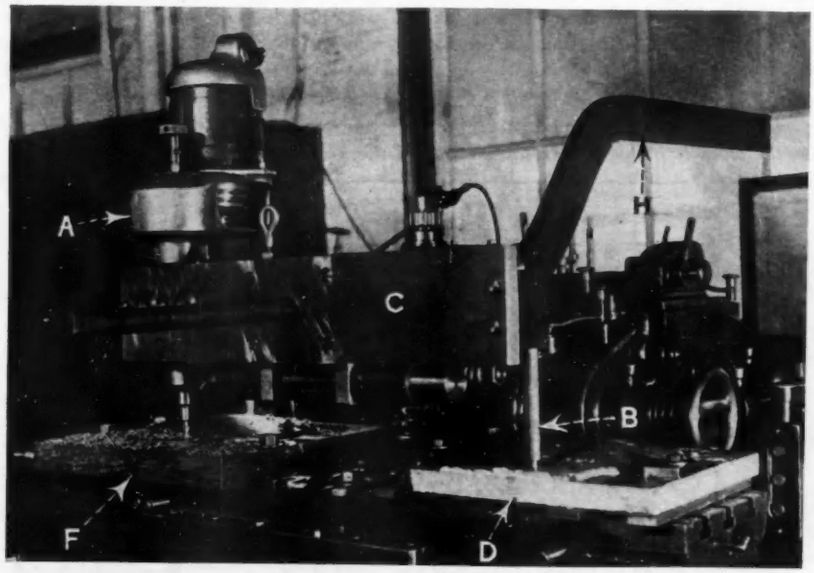
A Copying Attachment for the Milling Machine

ALEX. McEWEN
Die Shop Foreman
American Hard Rubber Company

Our die shop had an order for a master mold of rather unusual shape to be used as a pattern for casting soft-metal molds in which hard-rubber articles were to be cast. The shape of the article to be cast is that of a large disk having continuously curved convex sides. Since we had no Keller or other three-dimension machine, we designed and built the attachment illustrated. It was mounted on the overarm of a Van Norman milling machine, the cutter being driven by a Bridgeport high-speed milling head.

Both the milling head *A* and the tracing finger *B* are mounted on the plate *C*. Parallel-motion links on the back of plate *C*, and pivoted to the block holding the device on the overarm, maintain the milling head in a vertical position and cause the device to move up and down in unison with the tracing finger on the pattern.

Negative and positive plaster casts were made from an aluminum model of the hard-rubber product, the positive cast being used as a pattern in milling the master mold. Both the positive plaster cast *D* and the blank *F* for the master mold were mounted on the machine table in tandem, their center distance being the same as that between the milling head and the tracing finger.



By addition of a parallel-link motion and a motor-driven high-speed milling head mounted on the overarm, a knee-type milling machine was converted into a three-dimension copying machine

The counterbalance arm *H* is fulcrumed on the block holding the device on the overarm and is pivoted to one of the links on the back of plate *C*, so that its weight partly balances that of the device and tends to prevent the tracing finger from bearing too heavily on the fragile plaster cast.

For the roughing operation, the device is locked so that neither the milling head nor the tracing finger can move. The knee of the machine is then adjusted so that the lower end of the tracing finger clears the highest point of the plaster cast, leaving enough metal on the blank for the finishing cut.

For the finishing operation, the plaster cast is covered with a sheet of 0.008-in. shim stock and the device is unlocked. The knee is adjusted to permit the tracing finger to bear on the shim stock at the lowest point on the plaster cast. The purpose of the shim stock is to make the master mold slightly larger than the plaster cast to allow for shrinkage in the resulting molds to be cast and in the product to be cast therefrom.

The cuts are made by traversing the table, feeding inward by the crossfeed at each pass. Since the milling head moves up and down in unison with the tracing finger as it passes over the plaster cast, the master mold is a copy of the contour of the plaster cast.

Finding the Diagonal Dimension of a Square With Rounded Corners

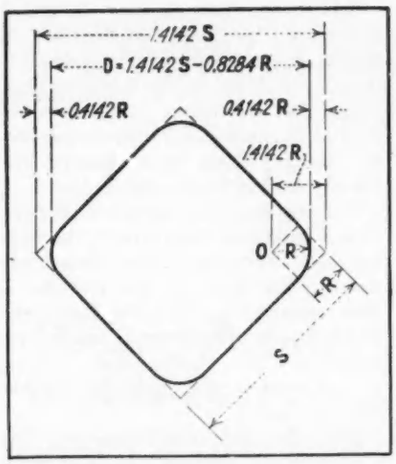
GEO. L. GREGORY
U. S. Naval Air Station, Pensacola

In laying out a broach for a square hole having rounded corners, as in the illustration, it is helpful to be able to calculate the diagonal dimension across the rounded corners, both for selecting the stock for the broach and for checking the finished tool.

This dimension D is $1.4142\ S - 0.8284\ R$,

Where S is the side of the square to the sharp corners, and R is the radius of a rounded corner.

To derive the formula given above, draw the dotted lines to O, completing the small square. Then, since R is a side of the small square, its diagonal dimension is $1.4142\ R$, and the distance from the sharp corner to the radial arc is $1.4142\ R - R = 0.4142\ R$. Since the same condition exists at the opposite sharp corner, the total reduction for the rounded corners is $2 \times 0.4142\ R = 0.8284\ R$. This amount is to be deducted from $1.4142\ S$, the diagonal of the large square across the sharp



After the corners of a square have been rounded at a known radius, the diagonal dimension across the rounded corners can be easily found by the formula given

corners, leaving the dimension D across the rounded corners, as given above.

Example: Find the dimension across the corners of a 7/6-in. (0.875) square having the corners rounded at a $\frac{3}{16}$-in. (0.1875) radius.

Solution: $D = (1.4142 \times 0.875) - (0.8284 \times 0.1875) = 1.2374 - 0.1553 = 1.0821$.

A Press Safety Aid for Small Plants

C. H. WILLEY

Superintendent of Manufacturing, Hoyt Electrical Instrument Works

In making a large quantity of rings for retaining glass, as shown at A, we used some 2½-in. blanks that were left as waste from another operation. Since the blanks had to be fed to the die one at a time, we wanted some device that would obviate the necessity for the operator to put his hands under the punch in placing them, so the inclined B was attached.

A blank is dropped into the chute and slides onto the die by gravity, being located by the stop C attached to the die shoe. In case any of the blanks are not located properly, they are helped by a hand brush.

When a ring has been stamped it adheres to the punch and when the ram nears the top of its stroke it is stripped from the punch by a knockout (not shown). Then the kicker D flips or kicks it into a receptacle.

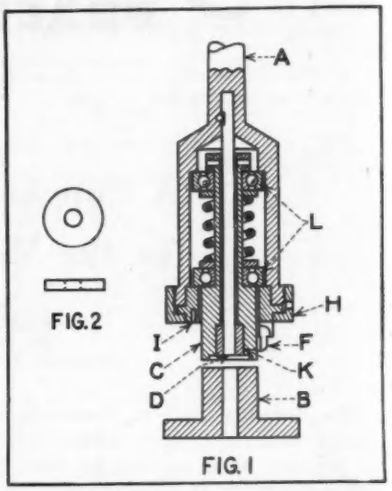
The kicker is made of spring brass and is attached to a bracket on the press frame. On the down stroke of the ram, the curled toe of the kicker is pushed aside by the beveled shoulder on the punch. As the ram ascends, the toe of the kicker slides off of the beveled shoulder of the punch and contacts the work under considerable tension. As the ram nears the top of its stroke, the work is stripped from the punch by the knockout, and just as it comes free, the kicker kicks into a receptacle, as stated above.

Tool for Cutting Valve Disks

BEN CLARK

While the tool illustrated in Fig. 1 will work well in many materials, it was designed for cutting out valve seats, such as the one in Fig. 2, from natural horn. The material is cut into suitable pieces for handling and is then disk-ground to the proper thickness, the disks being finished in the drill press.

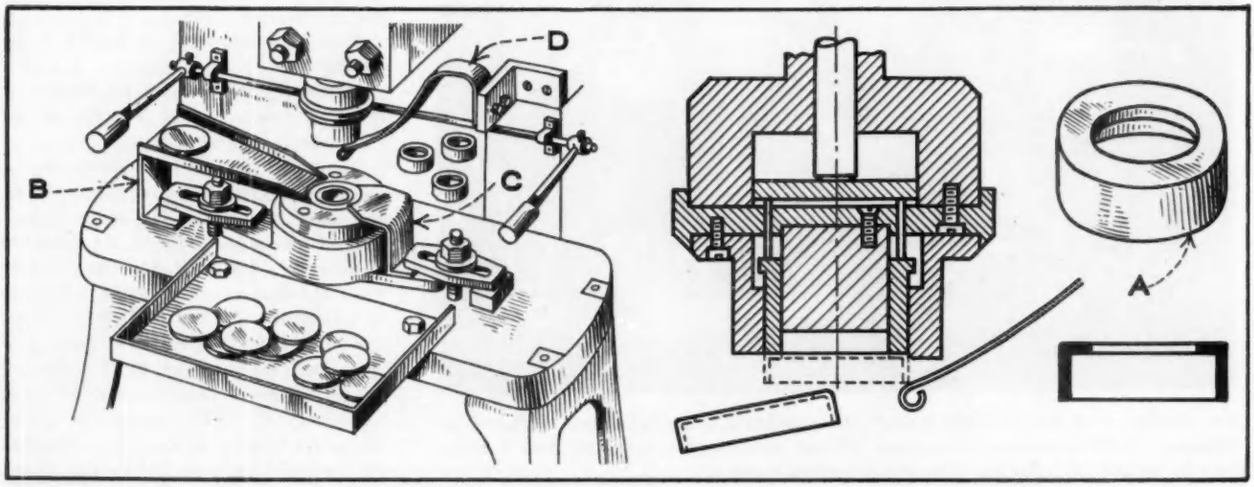
The shank A is held in a chuck in the drill press spindle and the anvil B is lined up with the pressure pad C, the work being held on the anvil and prevented from turning by the pressure pad. The hole is drilled and reamed by the combined drill and reamer D and the disk is trepanned by the cutter F. The cutter is held in adjustment by the nut H, which is turned by a pin spanner, the pin engaging in holes at I. Both the combined drill and reamer and the cutter are faced with cemented tungsten carbide.



Valve disks are drilled, reamed and trepanned from pieces of natural horn by this tool

The combined drill and reamer is set ahead of the cutter so that the reamer part can complete its work before the cutter finishes the outside. The reamer part of the combination is guided by the bushing K in the pressure pad. The thrust and radial ball bearings L are of large capacity.

When the ram nears the top of its stroke, the work is stripped from the punch and the kicker snaps it into a receptacle



Radius Milling Fixture

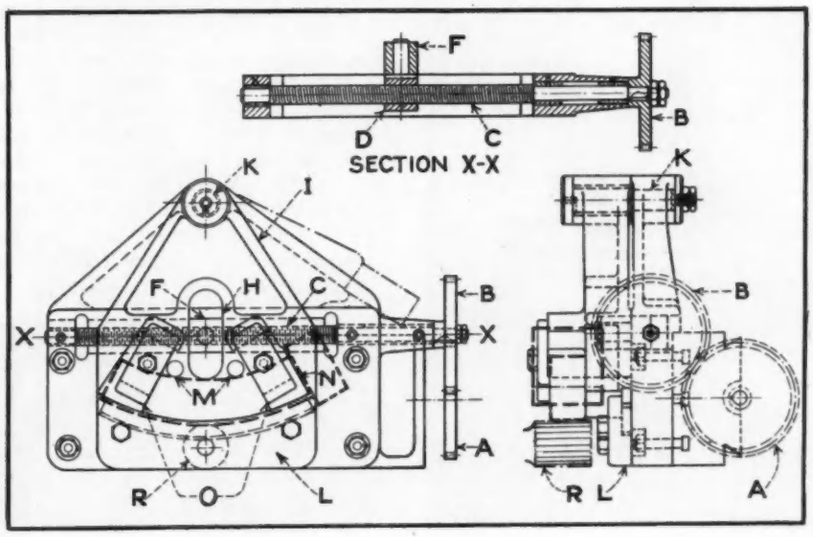
JOSEPH R. WHITTLES

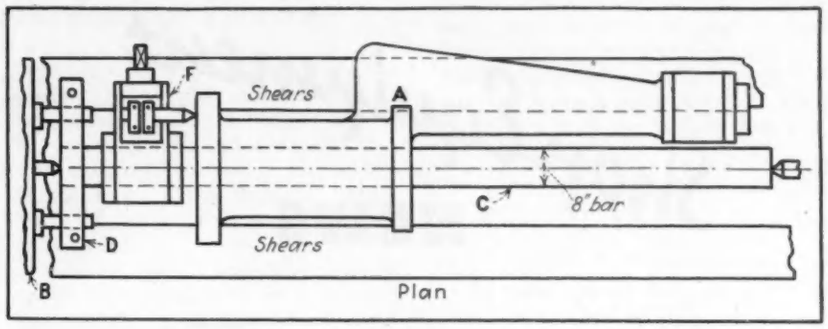
Recently we had to machine some curved forgings. Because of a projecting lug on one end, the forgings could not be machined in the lathe, so we designed the fixture illustrated for use in a vertical milling machine. Before mounting the fixture on the machine table, the nut for the traverse feed was removed, permitting the traverse screw to be revolved by the gears in the gearbox without moving the table.

Referring to the illustration, in place of the crank on the traverse screw is attached the gear *A*. This gear meshes with the gear *B*, which is attached to the screw *C* in the fixture base. The nut *D* on this screw is guided by the lower part engaging in a slot in the fixture base. A round extension on the upper part of the nut carries the pivot block *F* which engages the slot *H* in the swivel member *I* and causes that member to swivel about the pivot *K* as the screw *C* revolves. The plate *L* holds the outer part of the swivel member down on the fixture base.

The work, indicated by heavy dotted lines, is mounted on the swivel member and is located by the two hardened pins *M* and the finished surface *N*, against which the inner part of the projecting lug rests. The two clamps *O* secure the work in place. It will readily be understood that as the swivel member carrying the work is moved by the nut on the screw *C*, the work is swept past the cutter *R* in an arc, thus machining its outer edge.

The work is clamped on a swiveling member and is swept past the cutter in an arc by the action of a nut on a screw in the fixture base





To get the cylinder seat of an engine trunk at right angles to the slipper guide mount the facing head on the bar, not the faceplate

Errors in Machining Engine Trunks

J. T. TOWLSON
Enfield, Middlesex, England

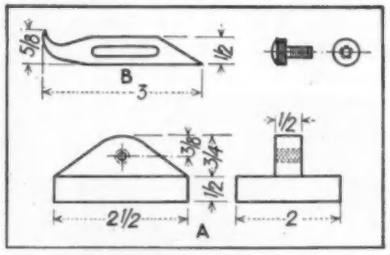
Use of the wrong method for boring and facing large parts, such as the larger details of horizontal steam engines, can prove mighty expensive. Some time ago my employers took on the job of finishing a pair of 16x26x32 in. stroke cross-compound condensing engines from a firm which had failed. The trunks of which a plan view is given, had been bored and the cylinder seats faced. We encountered serious trouble in fitting the cylinders to their seats because the cylinder bores did not line up with the bores of the slipper guides by quite 3/16 in. in the length of the cylinder and leading upwards. Obviously such an error meant that one or other of the parts would have to be scrapped. It was decided to throw away the trunks for the reason that they could not be corrected.

Next it was discovered that the facing and the boring of the cylinder seat was done with a facing head fixed to the large faceplate, whereas the facing head should have been gripped on and operated by the boring bar. It was found that the headstock of the lathe in which the work had been done was down at the faceplate end, and with the facing head fixed to the faceplate the machining of the cylinder seats was not at right angles with the slipper guides bored with the bar. The work should have been done as shown in the accompanying sketch where *A* is the engine trunk, *B* the faceplate, *C* the boring bar, *D* its driver and *F* the facing head fixed to the bar.

Scriber Block

C. F. FITZ

Quite often in laying out work with the aid of a surface gage, one comes across parts of the job where the standard-sized surface gage is too large to do the job accurately. The same difficulty often arises in setting up work on a machine, using the surface gage.



Where the ordinary surface gage is too large for convenience or accuracy, this scriber block will be found useful

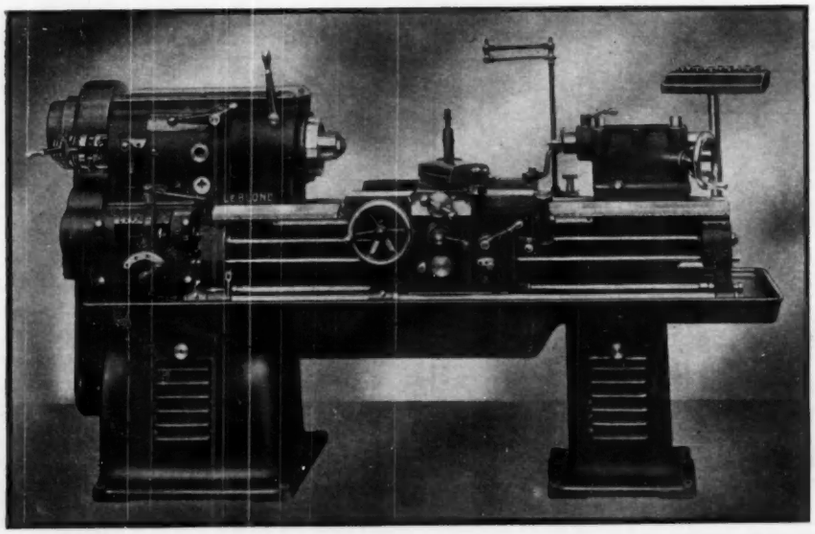
In order to overcome such difficulties, I made the scriber block illustrated, which is really a small surface gage. It consists of the hardened and ground steel base *A;* the scriber blade *B*, hardened, ground and lapped; and a screw and a washer for attaching the scriber blade to the base.

Shop Equipment NEWS

LeBlond Toolroom Lathe

Economy of operation is featured in the line of toolroom lathes offered by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. Headstock construction is simple but sturdy, with the spindle supported at short intervals in three large anti-friction bearings. The front and center spindle bearings are of the preloaded precision tapered roller type, while the end bearing is a floating roller bearing to compensate for variations in spindle length due to temperature changes. All headstock gears are hardened chromium-nickel steel with cut and ground teeth. The gears slide on splined shafts and the final drive is through a wide helical face gear. Compound gears for the feed and the reverse to the feed rod are built into the headstock.

The apron is of the double wall box type construction with one control for both longitudinal and cross movements. One shot lubrication is provided. Automatic length stops operate in both directions. The deep, well braced bed has a compensating front way construction. There are 56 quick changes of feed from 0.0013 in. to 0.166 in. per rev.; there are also 56 changes of thread from 1½ to 184 threads per inch. Leadscrew and feed rods have separate drives. Anti-friction thrust bearings are provided at both ends of the leadscrew. Spindle and feed reverse are both operated from the apron. Drive is through V-belts and a multi-disk combination driving clutch and brake.



Whitney Universal Cut-Off Machine

The No. 37 universal abrasive cutting-off machine, manufactured by the Whitney Metal Tool Co., 105 Mill St., Rockford, Ill., has a wide range of applications for cutting light materials. It will cut tubing, molding, angles, channels and hollow shapes of thin metal. Also, it will cut solid and hollow forms of hard metals that can not be cut by any other method. It is well adapted for cutting glass, porcelain, stone and various plastic materials. For cutting copper and other soft material a steel saw can be used in place of the abrasive wheel. The design of the universal wheel head and

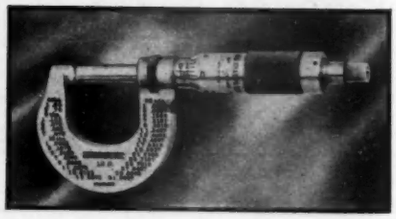
the universal angle vise permits cutting at any predetermined angle. Coolant equipment can be furnished.

The 10 x 3/32 x ½ in. wheel is protected with a heavy wheel guard. Drive is through V-belt from a 1-hp. motor mounted on the wheelhead unit. Wheel speed is 4,800 r.p.m. Vise jaws are 4¼ x 1 in. and have a maximum opening of 1½ in.

B. & S. Stainless Micrometer Calipers

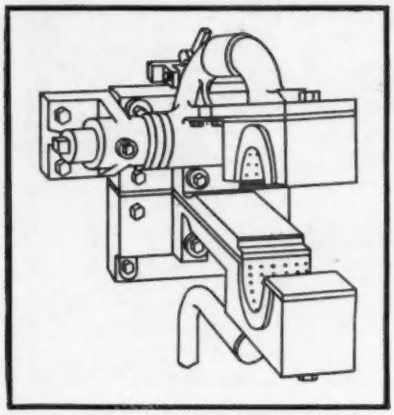
The stainless steel frame and thimble of the No. 12B and No. 13B micrometer calipers, recently announced by the Brown & Sharpe Mfg. Co., Providence, R. I., are proof against rust and stain caused by handling or liquids. Having the new Type "C" frame with a narrow anvil, they can be used for measuring in slots.

These models are furnished with or without a ratchet stop and are available in both English and metric measure. Either of these calipers can also be furnished with measuring surfaces tipped with tungsten carbide. Range of the No. 12B is from 0 to 1 in. by thousandths, and of the No. 13B is from 0 to 1 in. by ten-thousandths.



"Tocco" Induction Hardening Process

Selective surface-hardening by electrical induction heating and instantaneous pressure quenching of practically all ferrous materials of cylindrical section is now practical. The Ohio Crankshaft Co., Cleveland, Ohio, has announced the development of the "Tocco Process" for hardening shaft bearing surfaces. This process produces a surface hardened zone that blends gradually into the core with no sharp line of demarcation and consequently no opportunity for spalling.



Inductor blocks are hollow and are drilled for the quenching spray

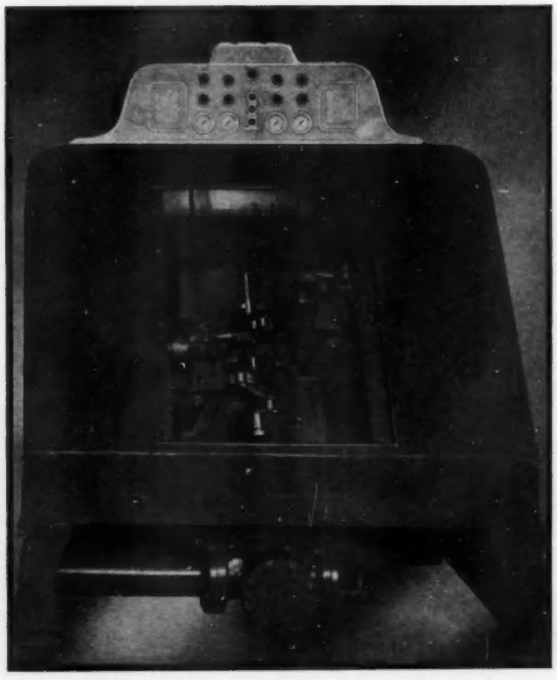
For Tocco-hardening, a high-frequency electric current at high voltage is transformed into low voltage with high amperage. This passes into inductor blocks which surround but do not actually touch the bearing area to be hardened. The inductor block current induces a current in the surface of the metal. This induced current heats the bearing area to the required temperature.

Accurate current and time controls permit the production of a desired temperature in a very short time. When the correct temperature is attained, the electrical circuit is opened and simultaneously the heated surface is quenched by a spray from a water jacket built into the inductor block.

The first application of the "Tocco" process perfected for industrial use is the hardening of crankshafts at the bearing surfaces. Manufacturers of engines have found that the process assures a superior hardened area, a longer-lived shaft and in many cases has effected pronounced savings in manufacturing costs. Expensive alloy steels have been eliminated and machining time has been reduced.

The steel to be used in a crankshaft that is to be Tocco-hardened should be of the fine-grained type and must pass the usual inspection tests. After forging, the crankshaft is allowed to cool slowly, this alone producing the necessary normalizing. Without further normalizing or heat-treating, it is then machined, radial oil holes are drilled and the journals rough ground. Final grinding follows the surface hardening operation.

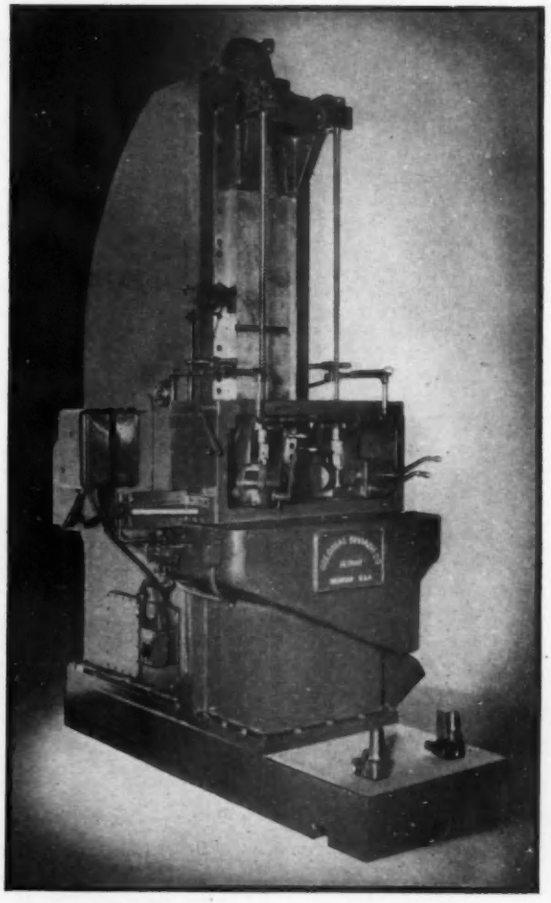
Crankshaft in position for hardening pin bearings. Inductor blocks are open



Colonial Broach For Round Cored Holes

By using splined broaches and taking two cutting strokes through the same hole the Colonial Broach Co., Detroit, Mich., has developed a solution to the problem of finish-broaching round holes accurately in a rough casting without the broach following an out-of-line condition in the cored hole. The illustrated set-up is designed to broach a 1¼-in. diameter hole 4 in. long in each of two malleable-iron castings in one work cycle. These holes are broached to a tolerance specification as to size and straightness of within 0.002 in.

A single-ram, 15-ton machine, equipped with two fixtures for right- and left-hand parts is used. Bushings are provided above and below the workpieces to prevent broach deflection.



After the first stroke the broach is returned through the spline it has cut. At the end of this return stroke the tripping of an air valve automatically indexes the fixtures 30 deg. At the end of the second stroke the fixtures automatically return to the first index position. The stroke is 48 in. and production is 180 pieces per hour.

Coppercote

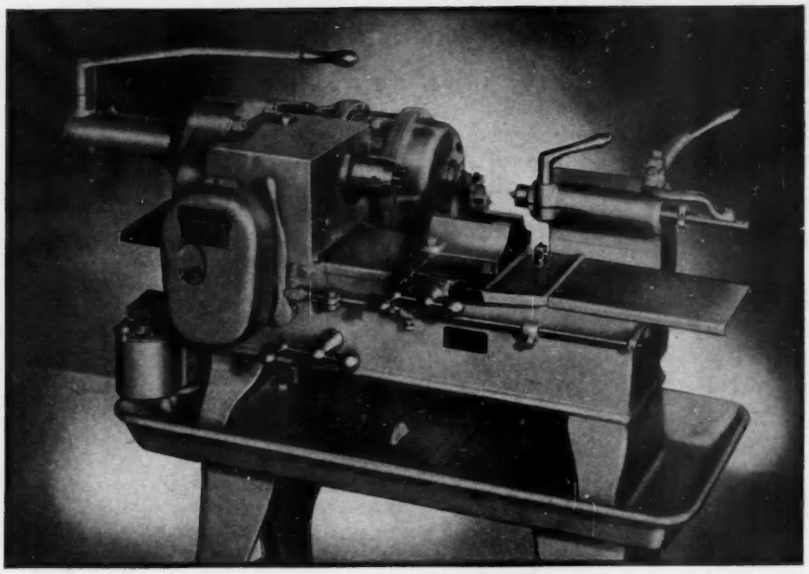
American Coppercote, Inc., 480 Lexington Ave., New York, N. Y., has announced the development of a closely knit, easily applied protective coating for wood, metal and other surfaces. Marketed under the trade name "Coppercote," this material consists of pure metallic copper of dendritic form in a suitable vehicle. It is supplied in liquid form and can be applied with a brush, by spraying or by dipping. Applied to a surface of ferrous metal, it will prevent corrosion. It will not crack, chip or scale as a result of the extremes of temperature.

"Grip-Flex" Couplings for V-Belts

An easily attached, flexible, V-belt coupling has been announced by the Shippert Mfg. Co., 414-6 S. Galena Ave., Dixon, Ill. This coupling is available for all standard V-belt sizes. Special sizes can be made to order.

Features of its construction include anchor plates that completely surround the belt ends, trailer pins in the larger sizes to ease heavy loads and shocks, and casehardened link-pin bearings. Because of its gripping action, the "Grip-Flex" coupling can be used on either fabric or cord type belts. It is efficient on flat or grooved pulleys.

Porter-Cable High-Speed Headstock for 9-In. Manufacturing Lathe



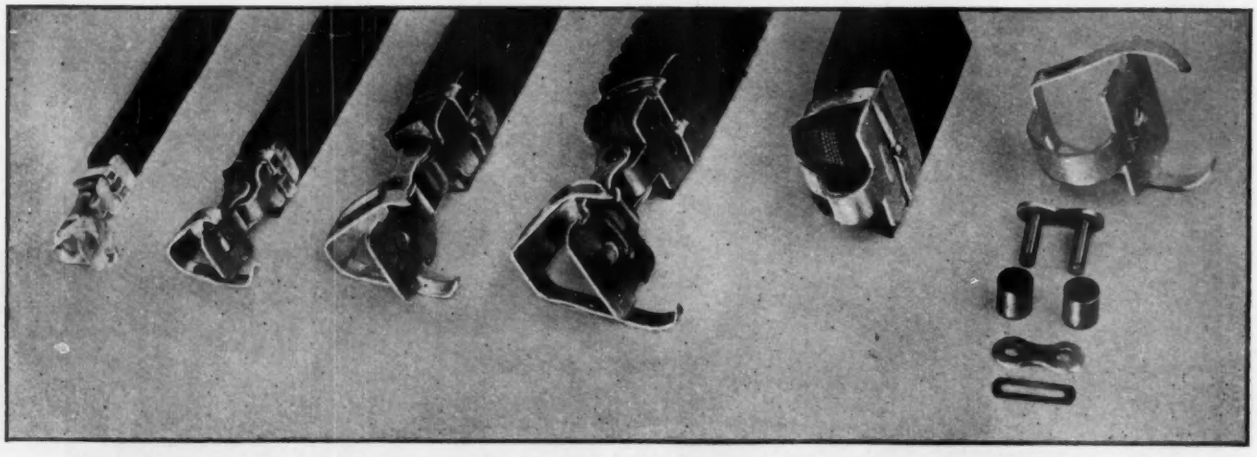
A hollow spindle allows the use of air cylinders or mechanically operated chuck closers

The Porter-Cable Machine Co., Syracuse, N. Y., announces a high-speed headstock for its 9-in. swing manufacturing lathe. Its purpose is the rapid turning, facing and boring of small precision parts such as valves, pistons, pulleys and commutators. It is particularly adapted to second-operation work with tungsten-carbide, stellite or diamond-tipped tools.

A wide range of multiple-tool set-ups is possible on both the front carriage and the facing attachment. The machine is adaptable to either chucking or between-centers work up to 20 in. long.

Spindle drive is through V-belts from a motor suspended by vulcanized rubber mountings to eliminate the transmission of vibration. Spindle speeds up to 3,600 r.p.m. may be obtained with proper pulley or motor combination. The clutch is eliminated, the spindle being operated direct from the motor. Starting, stopping and reversing are controlled by switches or push-buttons.

Feeds of 0.0005 to 0.010 in. per revolution may be obtained by means of pick-off gears. These gears are driven by V-belt from the spindle, assuring a constant feed ratio per revolution of the spindle. The backfacing attachment can be used in connection with the front carriage if desired. Because of the right-angle drive, the lathe takes little floor space.



"Grip-Flex" couplings allow V-belts to be shortened or applied between bearings without dismantling the machine

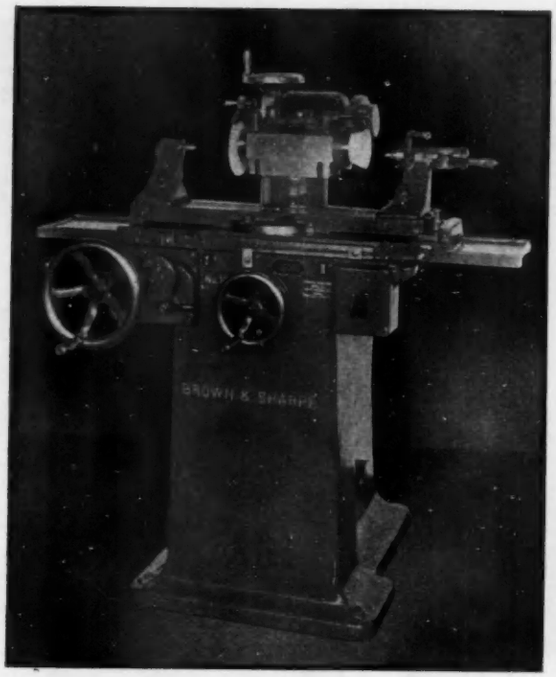
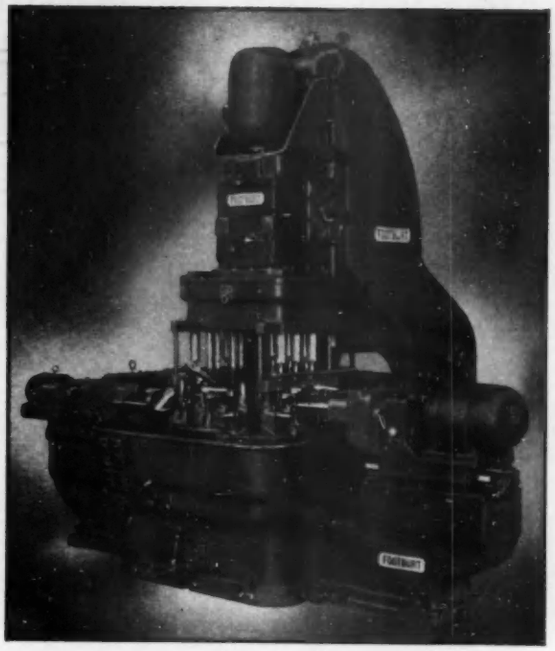


Table and spindle movements are made smoothly and accurately on this No. 10 B. & S. cutter grinder



In each cycle of the machine the four heads perform six separate operations on each part

B. & S. No. 10 Cutter Grinder

Requiring only one operating position, the No. 10 cutter and tool grinding machine manufactured by the Brown & Sharpe Mfg. Co., Providence, R. I., is smooth and accurate in operation, whether the work is light or heavy. Its low fixed height permits the operator to see the grinding wheel in contact with the work when at the natural position in front of the machine. All table and wheel controls are easily reached from this position.

The machine will accommodate all the usual types and sizes of cutters. The centers will swing work up to 10 in. diameter by 20 in. long. Maximum longitudinal table travel by handwheel is 18 in. A 4-in. table reciprocation by hand lever is available anywhere in the 18 in. travel. Largest diameter that can be ground on centers is 6 in.

A heavy one-piece base supports the sliding table and wheel-spindle column. The sliding table, mounted on a swivel table, is traversed at either $\frac{1}{16}$ in. or $6\frac{1}{2}$ in. per revolution of the handwheel. A graduated arc at the front of the swivel table reads to degrees and a scale at the end reads to 3-in. taper per foot. The centerhead is equipped with a clearance setting gage.

The wheel spindle column has a transverse movement of 7 in., controlled by a handwheel having a dial graduated to read to 0.001 in. It swivels to 90-deg. at either side of the zero line and has a scale graduated in degrees. Spring shoes maintain column alignment. A vertical setting clamp is provided. The $5\frac{1}{2}$-in. vertical adjustment is controlled by a handwheel graduated to 0.001 in.

A constant speed, dust-proof motor drives the cartridge-type spindle by V-belt at either 3,760 or 4,380 r.p.m. Accessories furnished include a universal head, cutter bars, tooth rests and wheel sleeves. Index centers, taper shank bushings, taper holding and face-mill grinding attachments and a No. 1 adjustable vise are available for use with this machine.

Foote-Burt Drilling and Tapping Machine

For drilling, chamfering and tapping an automotive part, the Foote-Burt Co., Cleveland, Ohio, has designed and built a four-way, 25-spindle, combination drilling and tapping machine.

The four heads are individually motor driven and each unit performs its individual cycle and returns to the starting position, remaining there until restarted by means of push-button control. The upper, the left-hand and the rear heads are mounted on hydraulic-feed drilling units and the right-hand head is mounted on a lead-screw tapping unit.

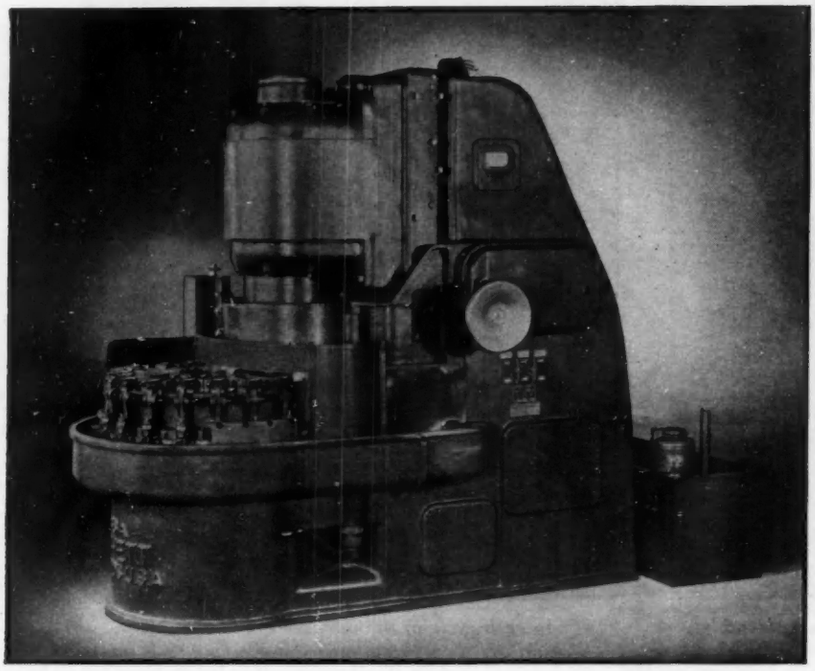
The upper head performs three operations on each part: drilling at the second station, boring at the third station and line reaming at the fourth station.

The work-holding fixture is mounted on a four-position, circular, indexing table. Each position in the fixture has provisions for locating and clamping three pieces.

"Ful-Vue" No. F-3105 Safety Goggle

A recent addition to the line of eye-protection equipment manufactured by the American Optical Co., Southbridge, Mass., is the No. F-3105 Ful-Vue safety goggle. This goggle has all of the features of the regular Ful-Vue line plus side shields that provide additional protection against particles striking from any direction. These side screens are easily cleaned. The mesh is sufficiently fine to prevent passage of flying particles but does not hinder air circulation.

Hanchett Rotary Surface Grinder



The Hanchett Manufacturing Co., Big Rapids, Mich., has announced the No. 96 rotary surface grinder for production grinding operations. The 30-hp., 900-r.p.m., fully inclosed, fan-ventilated motor is supported by the one-piece column. The wheelhead can be raised or lowered by hand or by means of a power feed employing a 2-hp. motor with pushbutton control.

The grinding wheel is 20-in. diameter, 3- or 4-in. high, with a 2- or 3-in. face. The wheel can be of either cylindrical or segmental type. The work table is 36-in. diameter and can be furnished as a rotary magnetic chuck. Table speeds from ½ to 1½ r.p.m. are available through a Transitorq variable-speed drive unit, which is direct connected to a 2-hp. motor. All electrical controls are located inside the column.

A hand-operated wheel dresser is built into the machine. An automatic sizing device compensates for wheel wear. The coolant system furnishes coolant at the center of the grinding wheel and onto the work through auxiliary nozzles. Total weight of unit is 17,000 lb.

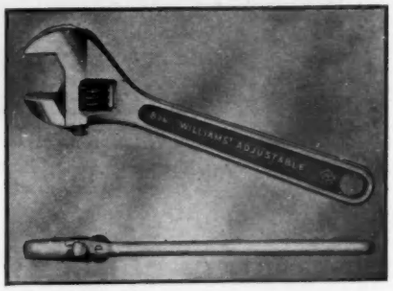
Radiac Type F Cut-Off Machine

The Type F Radiac bench model cut-off machine was introduced at the National Metals Exposition by A. P. de Sanno & Sons, Inc., 1615 McKean St., Philadelphia, Pa. This unit occupies a 20 x 30-in. bench space and is 20 in. high. It uses a 10 x 3/32 x ⅝-in. bakelite bond or a 10 x 1/16 x ⅝-in rubber bond wheel, and operates at 13,000 surface ft. per min. cutting speed. When the disk wheel has worn down to about 7 in. diameter, the speed of the disk can be stepped up to 13,000 surface ft. per min. by a change of the V-belts.

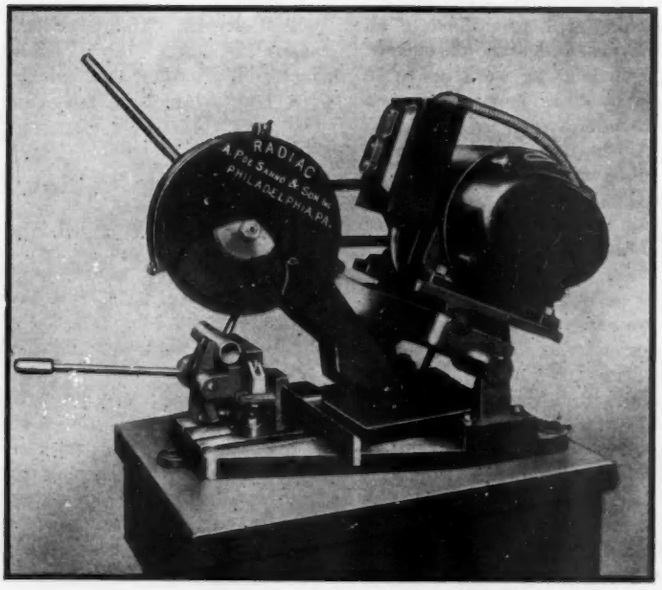
Solid metal stock up to ¾ in. diameter can be cut to size with a good finish. Metal tubing and fibrous materials up to 1¼ in. diameter may also be cut. For some materials, such as copper tubing, aluminum and laminated bakelite, it is desirable to use a steel saw instead of the abrasive disk. The clamping device is quick acting and holds the stock on each side of the cut. Clamping pressure is adjustable so that thin wall tubing can be cut without distortion.

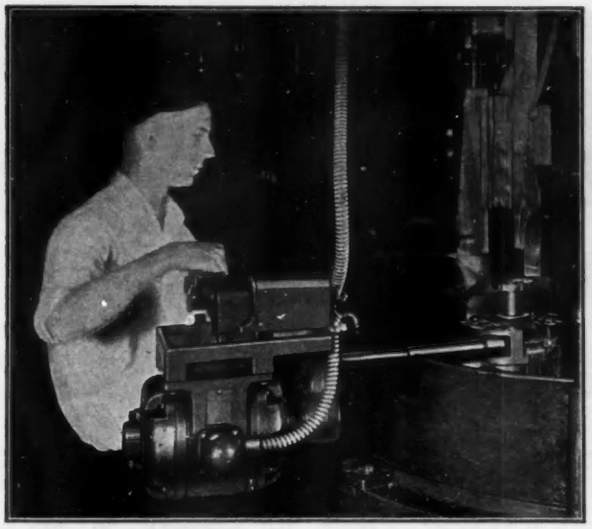
Williams Adjustable Forged Wrenches

Two lines of adjustable wrenches are now being manufactured by J. H. Williams & Co., 75 Spring St., New York, N. Y. Design improvements include square shoulders on the movable-jaw shank to overcome wedging and spreading action. Both lines are available in 4, 6, 8, 10 and 12 in. sizes.

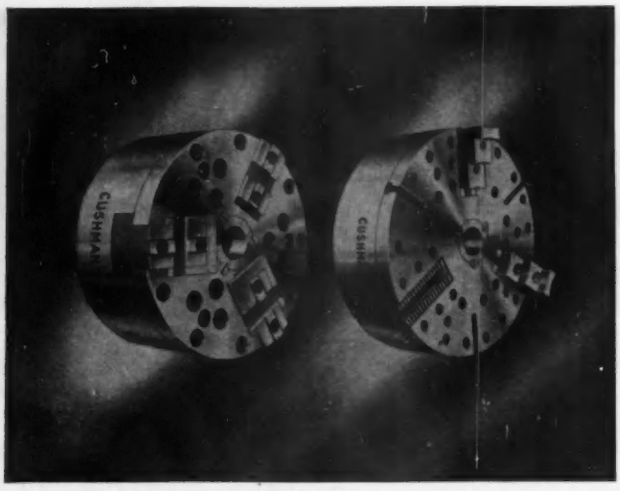


The "Adjustable" line wrenches are drop-forged from a special carbon steel and are supplied in a natural polished steel finish. The "Superadjustable" wrenches are forged from chrome-alloy steel and are thin, light and strong. This line is finished in chrome-plate with polished heads and satin-finish handles.





The Cushman power chuck wrench lessens operator fatigue and increases the production of multiple-spindle chucking machines



Cushman chucks are designed to permit refitting the jaws by grinding the under side of the faceplate. Fig. 1, left, shows the medium-duty model; Fig. 2, right, the heavy-duty pattern

Cushman Power-Chuck Wrench and Self-Centering Chucks

The Cushman Chuck Co., 806 Windsor St., Hartford, Conn., has introduced an electrically operated power chuck wrench that is suited for application to multiple-spindle chucking machines, drill presses and for rotating milling-machine indexing tables.

The wrench is driven by a high-torque, constant-speed reversible motor through a reducing gear and splined sleeve. The wrench shaft is splined and is moved forward to engage the chuck or back to the neutral position by the operator. The unit will swivel on its mounting bracket so that no harm will result should the chuck be indexed or rotated while the wrench is engaged. Special mounting brackets are available.

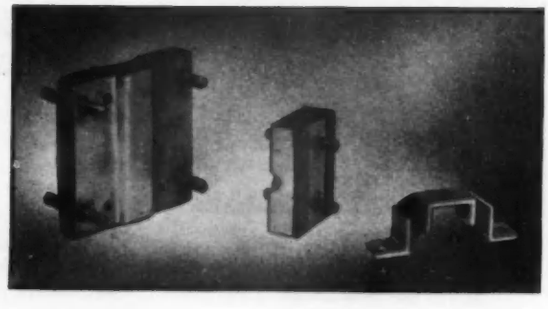
Motive power can be applied by means of a hand- or treadle-operated switch. The standard unit will apply approximately 300 lb.-ft. driving torque at the end of the splined shaft. If this is excessive, a motor having a lower torque rating can be furnished. Should a variable driving force be required a variable control unit is available that will reduce the effective pressure by as much as 50 per cent of the maximum.

Also, this company is manufacturing a line of self-centering chucks with a lever-actuated jaw movement. The No. 700A chuck, Fig. 1, is the medium-duty, two- or three-jaw design. The jaws are tongue-and-groove type of chrome-nickel, heat-treated steel, and are wide and deep. The jaws and levers are conveniently assembled in a solid steel body. The chuck face is a hardened steel plate mounted with hollow-head screws. This plate affords a wide bearing for the jaws. The jaw-levers, jaw-pins and center-plug pins are of chrome-nickel heat-treated steel. Lever bushings are renewable. Having a sealed face, this chuck is designed to exclude dirt and chips.

The No. 800A heavy-duty chuck, Fig. 2, has three jaws of the serrated type and has the same features as the No. 700A chuck. Primarily designed for use with Cushmatic electric power units, these chucks are equally adaptable for use with hydraulic or pneumatic units.

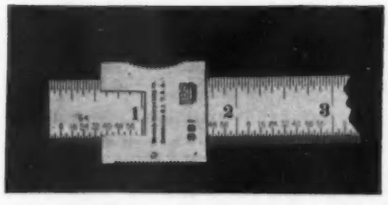
"Vibro-Insulators"

A standard line of vibration-damping rubber-to-metal mountings, known as "Vibro-Insulators" has been developed by the B. F. Goodrich Co., Akron, Ohio. These mountings are designed for bases of machines, electric and combustion motors, generators, vibrating screens and reciprocating mechanisms. The mountings are of the shear type, consisting of age-resisting rubber bonded to two metal plates, one of which is fastened to the vibrating member and the other to the support or foundation. There are three types: Type No. 1 for maximum load capacity of 800 lb., and a minimum frequency of 800 vibrations per min.; Type No. 2 for maximum load of 200 lb. and a minimum frequency of 1,200 vibrations per min., and Type No. 10 which is of the double-shear type for loads from 50 to 3,000 lb., and a minimum of 1,000 vibrations per min.

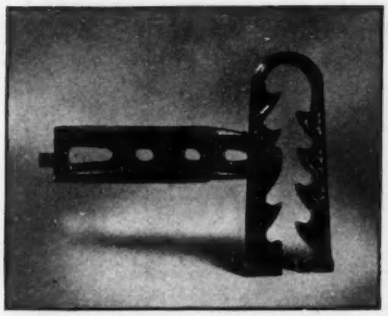


B. & S. No. 381 Rule Slide

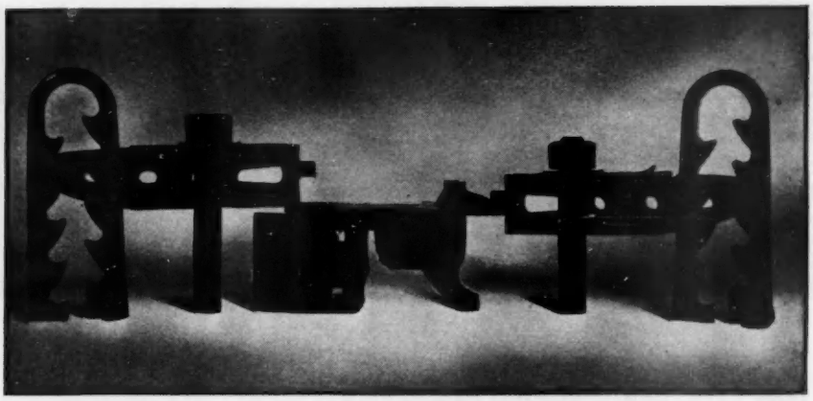
The No. 381 rule slide, recently announced by the Brown & Sharpe Mfg. Co. of Providence, R. I., can be used in combination with any one of several of its standard rules. This slide applied to a "Hook" rule will convert it to



a "Caliper" rule. Used with a straight rule it will facilitate shoulder to flange and similar measurements. The slide has a spring to hold it in place on the rule.



At the right is shown a typical set-up for clamping a part



Lord Clamping Blocks and Straps

Robert W. Lord, Box 292, Portsmouth, N. H., is introducing a clamping device for holding parts set-up for layout or machining operations. This unit consists of a block having stops of varying height, to support one end of the strap mating with the block.

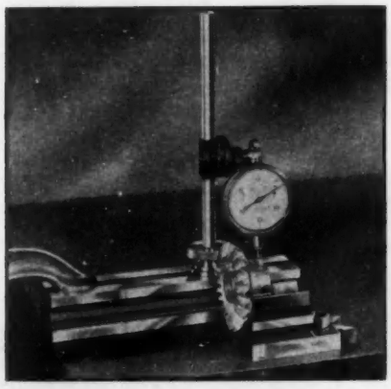
Both the blocks and the straps are available in 6-, 12-, 18- and 24-in. sizes. Blocks and straps of any size are interchangeable with similar units of any other size. These parts are crucible-steel castings of 70,000 to 80,000 lb. tensile strength and are designed for heavy-duty clamping. Clamping bolts up to 1¼-in. diameter may be used.

Starrett Dial Indicator, V-Block and Clamp

The No. 655 dial test indicator and the No. 567 V-block and clamp, developed by the L. S. Starrett Co. Athol, Mass., can be used in combination for production inspection of a wide variety of parts. They can also be used separately for unit operations.

The dial test indicator is furnished with a right-angle arm for adjustment beyond that obtainable with the standard horizontal arm. Either arm can be used in the toolpost of a lathe. The indicator can be furnished in a number of calibrations.

The V-block is hardened and ground steel. The sides are parallel and the V-grooves are central and parallel with the sides and the base. Hole clearance is provided for drilling and removing dowel pins. Four tapped holes facilitate attaching the block to faceplates and angle irons.



Starrett indicator and V-block set-up for inspection of bevel gears on production basis

Square D Type T A.C. Motor Starter

The Industrial Controller Division, Square D Co., 710 S. Third St., Milwaukee, Wis., is marketing an a.c. automatic line-voltage-type starter for polyphase motors. It is designed for remote operation of 7½—25 hp. motors. The starter is known as Type T, Class 8536.

The four major features are: accessibility for inspection, arrangement of parts for quick replacement, vertical closing section and compactness. Magnet assembly, stationary and moving contacts and thermal relays are replaceable units. They are arranged so the assembly can be taken apart completely and reassembled in approximately ten minutes.

GF Holdsall Small Parts Cabinet

The General Fireproofing Co., Youngstown, Ohio, has announced the "GF Holdsall" small parts cabinet. It is suitable for systematic storage of small parts. Made of steel, it is finished in a tough, oven-baked, olive-green, crinkle enamel that resists hard usage. The ten drawers are of varying height; three of the drawers have fixed compartments and the remaining seven have adjustable dividers for forming compartments of varying sizes. Parts up to 9¼x14¼x3¼ in. may be accommodated. The partitions, which divide the drawers in width, are slotted at 1 in. intervals for divider adjustment. Over-all dimensions: 20$\frac{3}{16}$ in. wide; 30$\frac{3}{16}$ in. high; 15⅛ in. deep. Drawer dividers are extruded for the insertion of labels to indicate contents of each compartment.

The Round Table

SOMETHING DIFFERENT

"Drawing again, Al? Getting out a new pump, I suppose."

"Drawing is right, Ed. I'm trying to find a way to make a better pump."

"That ought to give us the jump on the Hi-Lo Company. They haven't had anything new for a year. How soon can we get it out?"

"I'm not sure when we will get it out—even if it works as I think it will."

"What's the idea of holding back, Al? We want new things all the time."

"I'm not so sure, Ed. I'm wondering if we don't overdo it sometimes."

"I never thought you were a mossback, Al. Of course we need new things all the time."

"We need new things—but I'm not sure about changing design so often—unless of course we happen to invent something that really counts. It takes a lot of small improvements to make much difference in efficiency."

"Anything new gives our dealers something to talk about, and that helps to sell pumps."

"That's the great trouble, Ed. We all talk a lot about points that don't really cut much ice. I've got a different notion about improvements.

"Such as?"

"Well I'm inclined to think that we'd do better to make no changes until we could make enough to put out a radically different design."

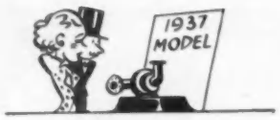
"What's the big idea, Al?"

"In the first place, every change costs us money for patterns, tools and in changing over in the shop. Sometimes we even have to charge more for the pumps, which increases sales resistance. If we don't make a change we can sell for less and add to our own profit."

"When would you make a change?"

"When we'd made enough improvements to show a real saving or a much better product. How often are the yearly models of cars different from the last, except in minor details?"

"Ford and Dodge started your way



but had to come to the new model idea, Al."

"I know it, but still I'm not sure it's better. I believe our customers would rather have our present pump for the lower cost we could give them if we made no alterations for three years—or five."

"So you'd be progressive once in five years, Al."

"Something like that, Ed. Unless you can come through with a really brilliant idea before that."

Is Ed right in advocating frequent changes to meet competition by providing sales arguments? Or is it better to wait for a real advance in engineering?

DISCUSSION

Covering Up

Instead of writing the customer that the failure of the pump was his fault in neglecting to oil it and that he will have to pay for the repairs, appeal to his sense of fairness by writing him, "We have reconditioned the pump you sent us and are returning it to you without charge. Examination before making the repairs indicated that the trouble was caused by lack of oiling. If investigation in your plant bears out this statement, would you care to pay for repairing the pump in the amount of $————, which represents the actual cost to us."

With Al's inventive genius combined with various types of oilless bearings, lubricating devices and grease-packed ball or roller bearings, it seems as though he could build a pump that would not be injured if someone forgot to oil it for a few days.

—W. A. WALTER,
Purchasing Agent,
Pneumatic Scale Corporation, Ltd.

Going Places

If we analyse the factors that have brought about the so-called mass-production methods in industry, we see

huge market potentialities attracting manufacture. The attractiveness of the field makes competition, which in turn reduces prices, so that costs must be constantly reduced. Parts have been redesigned again and again to facilitate cheaper manufacture. Materials and huge batteries of special machines have been developed with the same end in view. The whole procedure in instituting mass production was justified by the market and was necessary for the existence of those in the manufacturing business.

The most apparent reason to institute mass production and to go places with industrial products would be to increase profits. But when we consider the cost of getting much more business, new equipment and increasing the personnel, with results extremely doubtful, it is a headache well worth avoiding.

—Paul F. Frick.

One of the first essentials in any proposed expansion is a survey of the market, its capacity to absorb and its probable trend. Incidentally, it should be remembered that stability of demand is far more important than spectacular peaks. Such a survey should be carried out with great care by experts in the field, and its result should be the deciding factor for or against expansion.

If statistics were available showing the ratio of output to capacity and the brevity of capacity spells, then small-shop owners would be more contented with their lot. Another aspect, often forgotten, is that so soon as a business becomes really lucrative, a horde of competitors will enter the field, and some of them might swamp the small shop owner by sheer weight of capital.

—Roy Vernon Wade,
Clydebank, Glasgow, Scotland.

Ed's argument regarding the mass production of an industrial product deserves serious consideration. The potential market for such products, cheapened by mass production, cannot be ignored, as the achievements of the automobile and radio industries bear witness.

It is all a matter of enterprise, initiative and salesmanship in knowing the requirements of the potential customer and the price he is willing to pay, and then designing the product and planning its production to meet these requirements.

—R. G. Hewitt,
Huddersfield, Yorkshire, England

Yes, Yes!

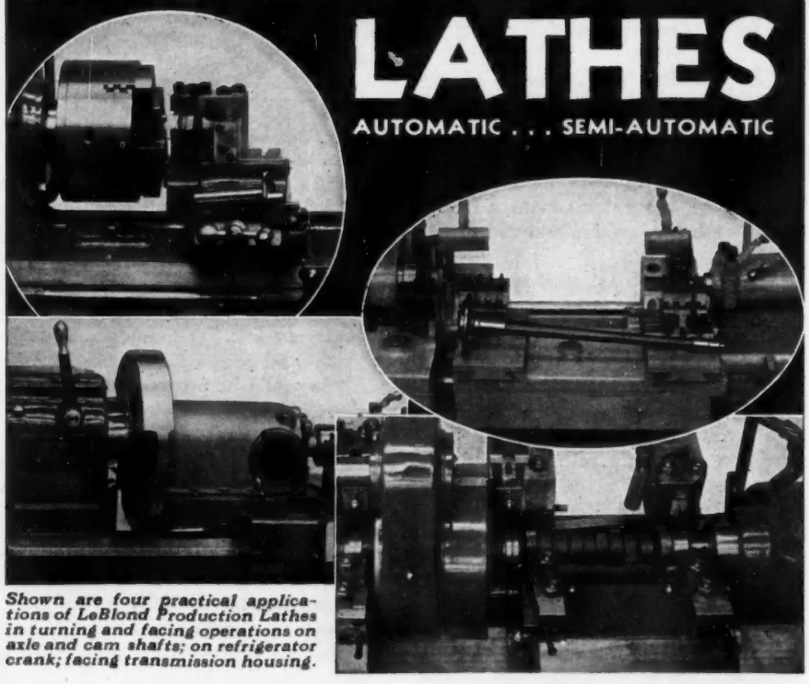
The views expressed by Al appear to represent actual facts, and Ed can be credited only with introducing matter relating to extreme cases of extreme men. It is generally understood that the common reply of "Yes" from an assistant infers that he is following and comprehending the instructions given.

The majority of managers hold their positions because of their knowledge of men, methods and machines. Thus Ed's remarks are more applicable to the newly promoted assistant, excellent in many ways but filled with exuberance. This creates for the manager a difficult problem in holding the reins; coaxing, not driving, and letting out gradually until the new man finds his feet and can be given his head.

—F. P. Terry,
Kingsford, Belfast, Ireland.

LEBLOND PRODUCTION LATHES

AUTOMATIC . . . SEMI-AUTOMATIC



Shown are four practical applications of LeBlond Production Lathes in turning and facing operations on axle and cam shafts; on refrigerator crank; facing transmission housing.

A limitless variety of rapid production work is possible with the modern LeBlond Semi-Automatic Multi-Cuts in 6, 9, and 12 inch sizes; the 11, 16, and 19 inch Rapid Production Lathes, and the 12 and 16 inch Automatic Lathes, all possessing outstanding advantages and improvements for speedy, precise, economical operation. LeBlond design and engineering are evident throughout: LeBlond unmatched quality is instantly recognized in every construction detail.

LITERATURE on any of the above Lathes on request. LeBlond engineers will be glad to assist in solving your production problems. No obligation, of course.

The R. K. LeBLOND MACHINE TOOL CO., CINCINNATI, O.
HALF CENTURY OF SERVICE TO INDUSTRY

Jam Threads

Al's idea of a jam thread is nothing new. It has been tried and even patented a number of times. Means for locking threads have troubled engineers ever since the screw was invented, and there are more than 7,000 patents on ways of locking threads.

If Al has ever tried to make a ¼-in. S.A.E. Class III fit he should have some idea of what he is up against. If, on top of this, he should try to make a little smaller angle and a bit larger thread, he would find that it is a mere matter of 0.0001 in. If he exceeds this limit he can probably jam the nuts on the bolts, but his customers will undoubtedly curse him when trying to take off the nuts. In the majority of cases the threads will have seized, and instead of supplying a lot of wrenches with his pumps, Al would do better to supply hacksaws and some spare blades, for his customers will surely need them to cut off the nuts.

The problem of securing bolts and nuts against failure is not to be solved by jam threads, no matter what form they may have, because the tolerances required can not be maintained in production. Jam threads were tried on rail joints years ago and proved to be a failure. Manufacturers of aircraft have found other means to get a 100 per cent satisfactory job, and so have makers of rock drills, and rock drills are a better "jiggle" test than Al could ever rig up. —A. SWANSTROM,
Elastic Stop Nut Corporation.

Al is not making a dangerous experiment. He is demonstrating something that would have saved us many dollars had we known about it many years ago. Continuous vibrations in many types of machinery have cost plenty in break-downs because someone forgot to put cotter pins in the bolts.

Just recently we had to send a man on a 2,000-mile trip to find out what had caused a machine of our make to fall down on the job. He reported that a couple of through bolts had dropped out because someone had neglected to drill and cotter them according to our practice.

If Al has given a few pumps good practical tests with jam threads, he is perfectly justified in trying them out on the trade. He has then satisfied himself that the pumps will perform continuously without danger of bolt and nut failure from vibration.
—E. E. GAGNON.

Another Story

"You can move material more easily on one floor," said Ed. Well, much depends upon the equipment for moving it, as well as the material to be moved. Massive machines are a one-floor proposition, but where there is a generous sprinkling of lighter products a two-story plant can be used to good advantage.

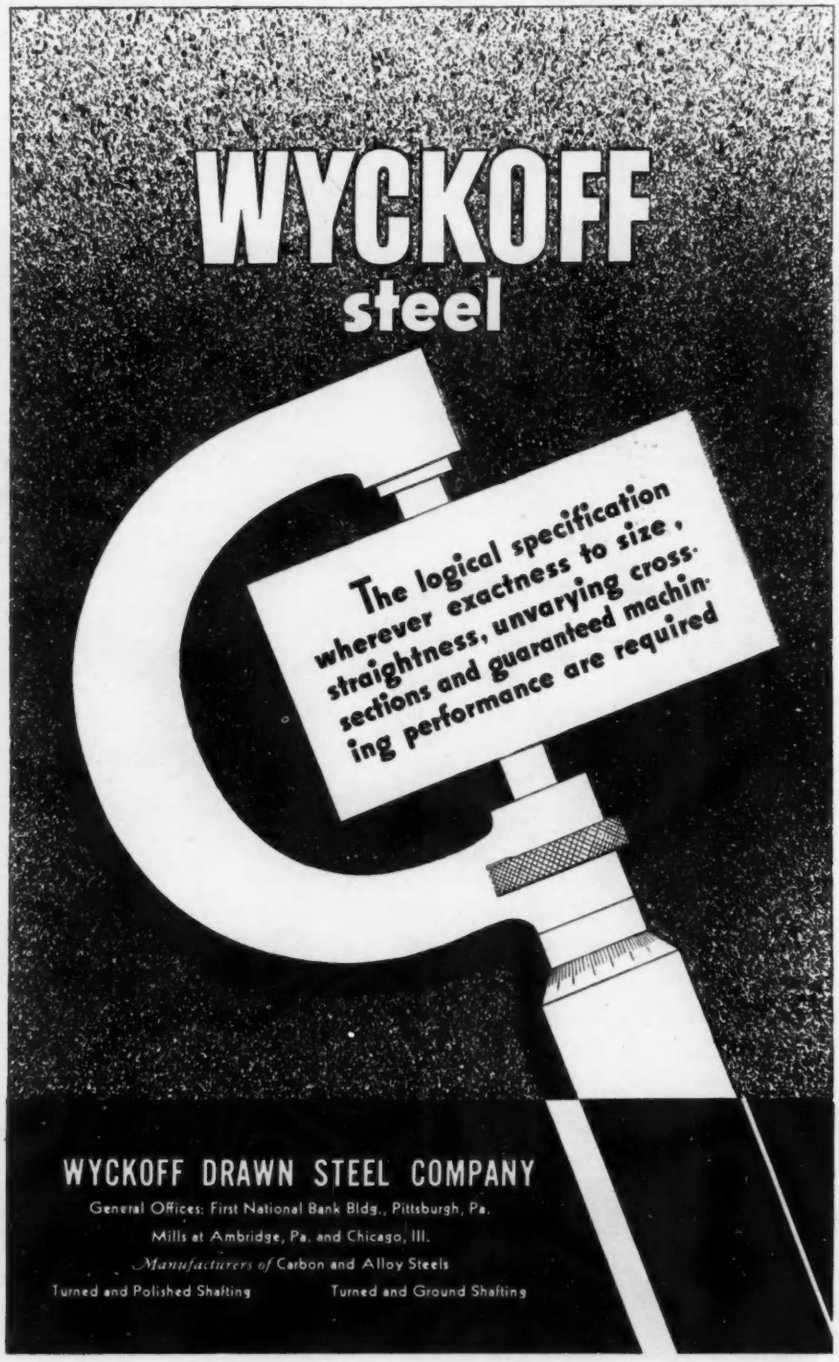
Much of the confusion that exists at an elevator entrance is chiefly due to using the elevator for traffic both ways. A good plan is to have two elevators where there is much traffic between floors and to designate one for up traffic and the other for down. Such an arrangement is of particular advantage in plants having three or more floors where relatively light material is to be moved between them.
—JOHN E. HYLER,
R. G. Le Tourneau, Inc.

Performance counts above everything in mechanical equipment. Quick and accurate shaping of metal is a part of the steady performance of Cincinnati Shapers.
THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO
SHAPERS - SHEARS - BRAKES

Variety

If Al has thoroughly investigated the drill press situation and is satisfied that the performance of his Jones machine compares favorably with that of its competitors, then he is justified in ordering another of the same make. His men will have the "feel" of the Jones machine and will be able to get maximum production from it right at the start, instead of having to become acquainted with the controls of a machine of different make. Otherwise, a certain amount of spoilage may occur because the operator fumbled the location of one of the levers at a critcial moment.

Then, too, the men have probably gotten together a collection of straps, bolts, angle plates and other gadgets that are just right for certain jobs on the Jones machine. Certain alterations will have to be made in order to fit them for use in a machine of another make, which would not have been necessary had the Jones machine been duplicated. The hard-headed shop owner is aware that he can budget his floor space in advance when he knows what footage a machine will require, and this is of advantage, particularly in the small shop. All told, the advantages of duplication in such a case will far outweigh the dubious attractions of variety. —ROBERT S. ALEXANDER.


WYCKOFF
steel
The logical specification wherever exactness to size, straightness, unvarying cross-sections and guaranteed machining performance are required
WYCKOFF DRAWN STEEL COMPANY
General Offices: First National Bank Bldg., Pittsburgh, Pa.
Mills at Ambridge, Pa. and Chicago, Ill.
Manufacturers of Carbon and Alloy Steels
Turned and Polished Shafting
Turned and Ground Shafting

Tools for Every Job

In certain jobs it is economy to segregate the tools, particularly when great accuracy is required and the class of help using tools from the toolcrib is not wholly composed of highly skilled mechanics. In all cases intelligence and judgment must be mixed with the other fellow's practice in order to arrive at the economical answer in each individual case.

Except on special or fussy jobs, the general practice in any but shops on high production will show that the time saved by using segregated tools is not worth the capital frozen in the tools. It is doubtful if even 20 per cent of the dollar's production in the average shop would be able to show savings enough to warrant investment in segregated tools. —E. E. GAGNON.

•

Protective Cream for the Hands

JOHN E. HYLER

The formula given for protective hand cream by Octave Antonio (*AM*—Vol. 80, p. 307) is interesting, but it is doubtful whether many men would care to make up their own material for this purpose when it can be readiy obtained on the market. Presumably Mr. Antonio's formula will give a safe and satisfactory product, but I regard it as unsafe for men to try mixing it up in some kitchens.

•

Power for Grinding

Builders and users of grinding machines are not always sure of the amount of power necessary, or desirable, for their machines. We see similar machines provided with motors that vary widely in horsepower. The problem is not easy in any way as we have different conditions when it comes to internal, external and surface grinding caused by differences in wheel contact with the work. The power necessary to remove a given amount of stock will vary with the type of grinding. It might also increase per unit of depth as the cut was increased.